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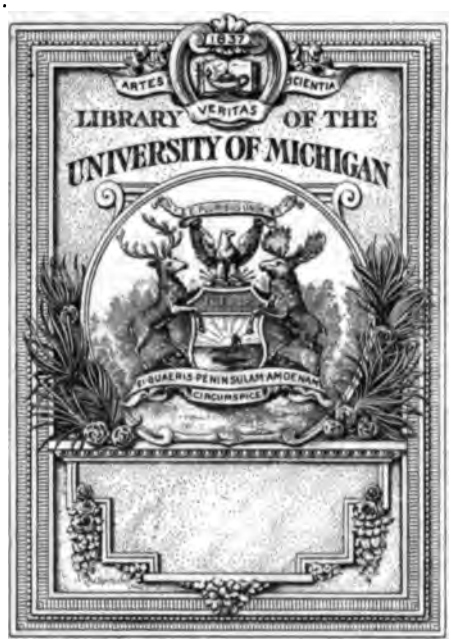

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MESSAGE OF THE PRESIDENT

To the Senate and House of Representatives:

I transmit herewith a preliminary report from the Inland Waterways Commission, which was appointed by me last March in response to a widespread interest and demand from the people. The basis of this demand lies in the general and admitted inability of the railroads to handle promptly the traffic of the country, and especially the crops of the previous fall.

This report is well worth your attention. It is thorough, conservative, sane, and just. It represents the mature judgment of a body of men exceptionally qualified by personal experience and knowledge of conditions throughout the United States, to understand and discuss the great problem of how best to use our waterways in the interest of all the people. Unusual care has been taken to secure accuracy and balance of statement. If the report errs at all it is by over-conservatism. It contains findings or statements of fact, a number of specific recommendations, and an account of inquiries still in progress, and it is based in part on statistics and other information contained in a voluminous appendix. The subject with which it deals is of critical importance both to the present and the future of our country.

Our river systems are better adapted to the needs of the people than those of any other country. In extent, distribution, navigability, and ease of use they stand first. Yet the rivers of no other civilized country are so poorly developed, so little used, or play so small a part in the industrial life of the nation as those of the United States. In view of the use made of rivers elsewhere, the failure to use our own is astonishing, and no thoughtful man can believe that it will last. The accompanying report indicates clearly the reasons for it and the way to end it.

The Commission finds that it was unregulated railroad competition which prevented or destroyed the development of commerce on our inland waterways. The Mississippi, our greatest natural highway, is a case in point. At one time the traffic upon it was without a rival in any country. The report shows that commerce was driven from the Mississippi by the railroads. While competition was limited, the railways with their overlapping terminals gave quicker and more satisfactory service than the waterways. Later they prevented the resumption of river traffic by keeping down their rates along the rivers, recouping themselves by higher charges elsewhere. They also acquired water fronts and terminals to an extent which made water competition impossible. Throughout the country the railways have secured such control of canals and steamboat lines that to-day inland waterway transportation is largely in their hands. This was natu-

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Our river systems are better adapted to the needs of the people than those of any other country. In extent, construction, navigability, and ease of use they stand first. Yet the rivers of no other civilized country are so poorly developed, so little used, or play so small a part in the industrial life of the nation as those of the United States. In view of the use made of rivers elsewhere, the failure to use our own is astonishing, and to thoughtful men can betoken but one thing. The accompanying report indicates clearly the reasons for it and the way to end it.

The Commission finds that it was unwise to abandon canals which previously had demonstrated the advantages of commerce on our inland waterways. The Mississippi, our greatest natural highway, is a case in point. In the time the traffic upon it was without a rival in any country. The report shows that commerce was driven from the Mississippi by the railroads. While prosperous, was limited, the railways will have sufficient business, pay quicker and more satisfactorily service than the waterways. Later they perceived the possibility of some traffic by charging lower rates along the rivers, requiring businesses in other centres elsewhere. They also argued, with some and sometimes with an effect which made water competition impossible. Throughout the country the railways have secured such control of canals and waterways that they could waterway transportation be neglect in their hands. This was inter-

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ral and doubtless inevitable under the circumstances, but it should not be allowed to continue unless under careful Government regulation.

Comparatively little inland freight is carried by boat which is not carried a part of its journey by rail also. As the report shows, the successful development and use of our interstate waterways will require intelligent regulation of the relations between rail and water traffic. When this is done the railways and waterways will assist instead of injuring each other. Both will benefit, but the chief benefit will accrue to the people in general through quicker and cheaper transportation.

The report rests throughout on the fundamental conception that every waterway should be made to serve the people as largely and in as many different ways as possible. It is poor business to develop a river for navigation in such a way as to prevent its use for power, when by a little foresight it could be made to serve both purposes. We can not afford needlessly to sacrifice power to irrigation, or irrigation to domestic water supply, when by taking thought we may have all three. Every stream should be used to the utmost. No stream can be so used unless such use is planned for in advance. When such plans are made we shall find that, instead of interfering, one use can often be made to assist another. Each river system, from its headwaters in the forest to its mouth on the coast, is a single unit and should be treated as such. Navigation of the lower reaches of a stream can not be fully developed without the control of floods and low waters by storage and drainage. Navigable channels are directly concerned with the protection of source waters and with soil erosion, which takes the materials for bars and shoals from the richest portions of our farms. The uses of a stream for domestic and municipal water supply, for power, and in many cases for irrigation, must also be taken into full account.

The development of our inland waterways will have results far beyond the immediate gain to commerce. Deep channels along the Atlantic and Gulf coasts and from the Gulf to the Great Lakes will have high value for the national defense. The use of water power will measurably relieve the drain upon our diminishing supplies of coal, and transportation by water instead of rail only will tend to conserve our iron. Forest protection, without which river improvement can not be permanent, will at the same time help to postpone the threatened timber famine, and will secure us against a total dearth of timber by providing for the perpetuation of the remaining woodlands. Irrigation will create the means of livelihood for millions of people, and supplies of pure water will powerfully promote the public health. If the policy of waterway improvement here recommended is carried out, it will affect for good every citizen of the Republic. The National Government must play the leading part in securing the largest possible use of our waterways; other agencies can assist and should assist, but the work is essentially national in its scope.

The various uses of waterways are now dealt with by Bureaus scattered through four Federal Departments. At present, therefore, it is not possible to deal with a river system as a single problem. But the Commission here recommends a policy under which all the commercial and industrial uses of the waterways may be developed

at the same time. To that end, Congress should provide some administrative machinery for coordinating the work of the various Departments so far as it relates to waterways. Otherwise there will not only be delay, but the people as a whole will fail to get from our streams the benefits to which they are justly entitled.

The Commission recognizes that the cost of improving our inland waterways will be large, but far less than would be required to relieve the congestion of traffic by railway extension. The benefits of such improvement will be large also, and they will touch the daily life of our people at every point, uniting the interests of all the States and sections of our country. The cost and the benefits should be equitably distributed, by cooperation with the States and the communities, corporations, and individuals beneficially affected. I heartily concur in the Commission's recommendation to this end. Such cooperation should result in united effort in carrying out the great duty of improving our inland waterways. While we delay our rivers remain unused, our traffic is periodically congested, and the material wealth and natural resources of the country related to waterways are being steadily absorbed by great monopolies.

Among these monopolies, as the report of the Commission points out, there is no other which threatens, or has ever threatened, such intolerable interference with the daily life of the people as the combination of companies controlling water power. I call your special attention to the attempt of the power corporations, through bills introduced at the present session, to escape from the possibility of Government regulation in the interests of the people. These bills are intended to enable the corporations to take possession in perpetuity of national forest lands for the purposes of their business, where and as they please, wholly without compensation to the public. For the effect of granting such privileges, taken together with rights already acquired under state laws, would be to give away properties of enormous value. Through lack of foresight we have formed the habit of granting without compensation extremely valuable rights amounting to monopolies on navigable streams and on the public domain. The repurchase at great expense of water rights thus carelessly given away without return has already begun in the East, and before long will be necessary in the West also. No rights involving water power should be granted to any corporations in perpetuity, but only for a length of time sufficient to allow them to conduct their business profitably. A reasonable charge should of course be made for valuable rights and privileges which they obtain from the National Government. The values for which this charge is made will inevitably, through the natural growth and orderly development of our population and industries, reach enormous amounts. A fair share of the increase should be safeguarded for the benefit of the people, from whose labor it springs. The proceeds thus secured, after the cost of administration and improvement has been met, should naturally be devoted to the development of our inland waterways.

The report justly calls attention to the fact that hitherto our national policy has been one of almost unrestricted disposition and waste of natural resources, and emphasizes the fundamental necessity for conserving these resources upon which our present and future success as a nation primarily rests. Running water is a most valu-

able natural asset of the people, and there is urgent need for conserving it for navigation, for power, for irrigation, and for domestic and municipal supply.

The Commission was appointed to obtain information concerning our waterways as related to the general welfare. Much work was done, but more remains to be done before a plan for their development can be prepared in detail. We need additional information on the flow of our streams, the condition of channels, the amount and cost of water traffic, the requirements for terminals, the area in each watershed which should be kept under forest, and the means of preventing soil waste and the consequent damage to our rivers. But it is neither necessary nor desirable to postpone the beginning of the work until all the facts are obtained. We have suffered heavily in the past from the lack of adequate transportation facilities, and unless a beginning is made promptly we shall suffer still more heavily in the future.

Being without funds or an expert staff, the Commission has confined itself to principles affecting the whole problem and the entire country. Its report is a plea, in the light of actual facts, for simplicity and directness in dealing with the great problem of our inland waterways in the interest of the people. It submits no specific plans or recommendations concerning even the most important projects. The first of these of course concerns the Mississippi and its tributaries, whose commercial development will directly affect half our people. The Mississippi should be made a loop of the sea and work upon it should be begun at the earliest possible moment. Only less important is the Atlantic inner passage, parts of which are already under way. The inner passages along the Gulf coast should be extended and connected with the Atlantic waters. The need for the developing of the Pacific coast rivers is not less pressing. Our people are united in support of the immediate adoption of a progressive policy of inland waterway development.

Hitherto our national policy of inland waterway development has been largely negative. No single agency has been responsible under the Congress for making the best use of our rivers, or for exercising foresight in their development. In the absence of a comprehensive plan, the only safe policy was one of repression and procrastination. Frequent changes of plan and piecemeal execution of projects have still further hampered improvement. A channel is no deeper than its shallowest reach, and to improve a river short of the point of effective navigability is a sheer waste of all it costs. In spite of large appropriations for their improvement, our rivers are less serviceable for interstate commerce to-day than they were half a century ago and in spite of the vast increase in our population and commerce they are on the whole less used.

The first condition of successful development of our waterways is a definite and progressive policy. The second is a concrete general plan, prepared by the best experts available, covering every use to which our streams can be put. We shall not succeed until the responsibility for administering the policy and executing and extending the plan is definitely laid on one man or group of men who can be held accountable. Every portion of the general plan should consider and so far as practicable secure to the people the use of water for power, irrigation, and domestic supply as well as for navigation.

No project should be begun until the funds necessary to complete it promptly are provided, and no plan once under way should be changed except for grave reasons. Work once begun should be prosecuted steadily and vigorously to completion. We must make sure that projects are not undertaken except for sound business reasons, and that the best modern business methods are applied in executing them. The decision to undertake any project should rest on actual need ascertained by investigation and judgment of experts and on its relation to great river systems or to the general plan, and never on mere chance.

The improvement of our inland waterways can and should be made to pay for itself so far as practicable from the incidental proceeds from water power and other uses. Navigation should of course be free. But the greatest return will come from the increased commerce, growth, and prosperity of our people. For this we have already waited too long. Adequate funds should be provided, by bond issue, if necessary, and the work should be delayed no longer. The development of our waterways and the conservation of our forests are the two most pressing physical needs of the country. They are interdependent, and they should be met vigorously, together, and at once. The questions of organization, powers, and appropriations are now before the Congress. There is urgent need for prompt and decisive action.

THEODORE ROOSEVELT.

THE WHITE HOUSE, *February 26, 1908.*

PRELIMINARY REPORT

OF THE

INLAND WATERWAYS COMMISSION

FEBRUARY 4, 1908

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PRELIMINARY REPORT

WASHINGTON, D. C., *February 3, 1908.*

THE PRESIDENT:

SIR: Your attention is respectfully invited to the following Preliminary Report of the Inland Waterways Commission:

CREATION OF THE COMMISSION

The Inland Waterways Commission was created by the President of the United States through the following instrument:

THE WHITE HOUSE,
Washington, March 14, 1907.

MY DEAR SIR: Numerous commercial organizations of the Mississippi Valley have presented petitions asking that I appoint a commission to prepare and report a comprehensive plan for the improvement and control of the river systems of the United States. I have decided to comply with these requests by appointing an Inland Waterways Commission, and I have asked the following gentlemen to act upon it. I shall be much gratified if you will consent to serve:

Hon. Theo. E. Burton, chairman.
Senator Francis G. Newlands.
Senator William Warner.
Hon. John E. Lamberson.
General Lessingham Machemehl.
Mr. W. J. Mason.
Mr. F. H. Newell.
Mr. Gifford Pinchot.
Hon. Serno Lane Smith.

Purpose of Commission.

Policy.

In creating this Commission I am influenced by broad considerations of national policy. The control of our navigable waterways has with the Federal Government, and carries with it corresponding responsibilities and obligations. The energy of our people has hitherto been largely directed toward material development, connected with land and forest and with coal and iron, and some of these sources of material and power are already largely depleted, while our inland waterways as a whole have thus far received scant attention. It is becoming clear that our streams should be considered and conserved as great national resources. Works designed to control our waterways have thus far usually been undertaken for a single purpose, such as the improvement of navigation, the development of power, the irrigation of arid lands, the protection of lowlands from floods, or to supply water for domestic and manufacturing purposes. While the rights of the people to these and similar uses of water must be respected, the time has come for merging local projects and uses of the inland waters in a comprehensive plan, designed for the benefit of the entire country. Such a plan should consider and include all the uses to which streams may be put, and should bring together and coordinate the points of view of all users of water. The task involved in the full and orderly development and control of the river systems of our inland States is a great one, yet it is certainly

Scope of Commission.

Rights of people.

Comprehensive plan.

Importance.

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* Marginal figures and letters refer to paragraphs in following Legislative Recommendations, Findings, Work Done, Recommendations, and Bureau Memoranda in Inquiries in Progress.

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Senator William Warner.
Hon. John E. Humphrey.
General Alexander Mackenzie.
Mr. W J McGee.
Mr. F. H. Newell.
Mr. Gifford Pinchot.
Hon. Herbert Knox Smith.

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[1] Marginal figures and letters refer to paragraphs as follows: Roman numerals to Findings, black letters to Recommendations, and Roman numerals to Inquiries in Progress.

not too great for us to approach. The results which it seems to promise are even greater.

Railway Congestion. 2-5, 17: C, D, H.

It is common knowledge that the railroads of the United States are no longer able to move crops and manufactures rapidly enough to secure the prompt transaction of the business of the Nation, and there is small prospect of immediate relief. Representative railroad men point out that the products of the northern interior States have doubled in ten years, while the railroad facilities have increased but one-eighth, and there is reason to doubt whether any development of the railroads possible in the near future will suffice to keep transportation abreast of production. There appears to be but one complete remedy—the development of a complementary system of transportation by water. The present congestion affects chiefly the people of the Mississippi Valley, and they demand relief. When the congestion of which they complain is relieved, the whole Nation will share the good results.

Navigation. 1: A: I.

Evils to be met.

While rivers are natural resources of the first rank, they are also liable to become destructive agencies, endangering life and property; and some of our most notable engineering enterprises have grown out of effort to control them. It was computed by Generals Humphreys and Abbott half a century ago that the Mississippi alone sweeps into its lower reaches and the Gulf 400,000,000 tons of floating sediment each year (about twice the amount of material to be excavated in opening the Panama Canal), besides an enormous but unmeasured amount of earth-salts and soil-matter carried in solution. This vast load not only causes its channels to clog and flood the lowlands of the lower river, but renders the flow capricious and difficult to control. Furthermore, the greater part of the sediment and soil-matter is composed of the most fertile material of the fields and pastures drained by the smaller and larger tributaries. Any plan for utilizing our inland waterways should consider floods and their control by forests and other means; the protection of bottom-lands from injury by overflow, and up-lands from loss by soil-wash; the physics of sediment-charged waters and the physical or other ways of purifying them; the construction of dams and locks, not only to facilitate navigation but to control the character and movement of the waters; and should look to the full use and control of our running waters and the complete artificialization of our waterways for the benefit of our people as a whole.

Erosion. 9: A, I.

Floods. 8, 10-12: A, I.

Power. 13, 24: A, I.

Artificialization. 15, 22: I : II

Conservation. 23 : G : I.

It is not possible to properly frame so large a plan as this for the control of our rivers without taking account of the orderly development of other natural resources. Therefore, I ask that the Inland Waterways Commission shall consider the relations of the streams to the use of all the great permanent natural resources and their conservation for the making and maintenance of prosperous homes.

Cooperation. 21 : I : III.

Any plan for utilizing our inland waterways, to be feasible, should recognize the means for executing it already in existence, both in the Federal Departments of War, Interior, Agriculture, and Commerce and Labor, and in the States and their subdivisions; and it must not involve unduly burdensome expenditures from the National Treasury. The cost will necessarily be large in proportion to the magnitude of the benefits to be conferred, but it will be small in comparison with the $17,000,000,000 of capital now invested in steam railways in the United States—an amount that would have seemed enormous and incredible half a century ago. Yet the investment has been a constant source of profit to the people, and without it our industrial progress would have been impossible.

Extension. 1 : A : II.

The questions which will come before the Inland Waterways Commission must necessarily relate to every part of the United States and affect every interest within its borders. Its plans should be considered in the light of the widest knowledge of the country and its people, and from the most diverse points of view. Accordingly, when its work is sufficiently advanced, I shall add to the Commission certain consulting members, with whom I shall ask that its recommendations shall be fully discussed before they are submitted to me. The reports of the Commission should include both a general statement of the problem and recommendations as to the manner and means of attacking it.

Recommendations. A-I.

Sincerely yours,

THEODORE ROOSEVELT.

PROCEEDINGS

After conference and correspondence between the chairman and other Commissioners, a meeting for organization was held in the United States Capitol beginning April 29 and ending May 4. A second meeting and inspection trip on the Mississippi from St. Louis to the Passes took place May 13 to May 23. A third meeting and inspection trip, first on the Great Lakes from Cleveland to Duluth, next on the Mississippi from St. Paul to Memphis, and then on the Missouri from Kansas City to St. Louis, took place September 21 to October 12. A fourth meeting was held in the United States Capitol beginning on November 25, 1907, for the purpose of preparing a preliminary report, ended February 3, 1908.

At the first session of the meeting for organization, on April 29, the Commission expressed concurrence in the designation by the President of Mr. Burton as chairman; and by viva voce votes Senator Newlands and Mr. McGee were elected vice-chairman and secretary, respectively.

During the organization and two inspecting meetings, 31 formal sessions were held in addition to informal meetings and conferences. At several of these sessions the entire Commission were present; at no session were there fewer than five Commissioners; the average attendance was over 7. During the meeting for the preparation of this report there were 27 sessions, with an average attendance of 7.

While provision was not made for formal hearings, experts on matters entrusted to the Commission were present by invitation at 24 sessions; of these experts there were 24, of whom several attended two or more sessions, a majority being now or formerly attaches of the Corps of Engineers, United States Army.

In addition to the formal sessions, the Commissioners devoted much time to the consideration of the waterways and related matters; two or three Commissioners jointly inspected the upper Missouri, the Columbia and Snake, the Sacramento and San Joaquin, and their leading tributaries; several employed agencies under their direction in collating and digesting data relating to canals, water transportation, etc.; and most of the Commissioners attended conventions and other meetings connected with the development of waterways and related interests.

A journal was kept, including brief minutes of the sessions and itineraries of inspection trips, with stenographic reports of the statements and deliberations of the second and third meetings; and in addition correspondence was conducted and a number of useful memoranda and printed statements were brought together and used in the deliberations of the Commission.

At the eighteenth session a special committee of one was appointed to prepare a list of statutes, etc., relating

to water power.[a] Pursuant to action at the twenty-third session (the President of the United States presiding) a letter requesting a conference on the conservation of natural resources was framed and presented to the President on October 4; and at the twenty-fifth session a committee of three was appointed to communicate further with the President on this matter, and also to prepare a preliminary draft of report. The former committee prepared an exhaustive digest of statutes, and the latter held a number of sessions; both committees reported at the fourth meeting.

RESULTS

The investigations and discussions have resulted in certain statements of fact connected with navigation and other uses of the inland waterways set forth hereinafter as *Findings*, with certain conclusions set forth as *Recommendations*, and also certain matters still under discussion which are set forth as *Inquiries in progress*.

The Commission is fully aware that its creation was due to a demand of the people, and that there exists an expectation in certain localities that the report here presented will include plans extending in detail to the principal waterways of the country. To prepare and consider such plans would require extended study at large expense by engineers and other experts whose services were not available. Under the instructions from the President, and in the absence of funds and of the men and time required for such study, the Commission was necessarily confined in preparing this preliminary report to the more general features of "a comprehensive plan designed for the benefit of the entire country," viz, a statement of principles and an outline of policy, coupled with recommendations which, if adopted, will insure the continuation of the work and the practical application of the principles and policy.

FINDINGS[b]

Navigation.

1. The possibilities of inland navigation are indicated by the fact that there are in mainland United States some 25,000 miles of navigated rivers and at least an equal amount which are navigable or might be made so by improvement; there are also some 2,500 miles of navigable canals, and over 2,500 miles of sounds, bays, and bayous readily connectable by canals aggregating less than 1,000 miles in length to form inner passages paralleling the Atlantic and Gulf coasts—these being additional to some thousands of miles (reckoned between leading ports) of regularly navigated waters in lakes and

A-I: I, II.

[a] The statutes brought together by the special committee form part of the Appendix, pp. 593 et seq.

[b] Details appear in the appended statistical and other papers. Marginal letters and figures refer to paragraphs in Recommendations (black letters) and Inquiries in Progress (Roman numerals) respectively.

land-locked bays. These waterways lie in or along the borders of Alabama, Arkansas, California, Connecticut, Delaware, Florida, Georgia, Idaho, Illinois, Indiana, Iowa, Kansas, Kentucky, Louisiana, Maine, Maryland, Massachusetts, Michigan, Minnesota, Mississippi, Missouri, Montana, Nebraska, New Hampshire, New Jersey, New York, North Carolina, North Dakota, Ohio, Oklahoma, Oregon, Pennsylvania, Rhode Island, South Carolina, South Dakota, Tennessee, Texas, Vermont, Virginia, Washington, West Virginia, and Wisconsin, i. e., 42 States; while the development of rivers for irrigation, power, and other purposes will also render navigable certain waterways in Arizona, Colorado, Nevada, New Mexico, Utah, and Wyoming. Although it is not probable that any considerable share of this vast mileage of navigable waterways will be improved to a high standard of efficiency as soon as an early date, yet the assured growth of the country and the capacity of these waters not only for navigation but for other uses render imperative the necessity for their control and utilization as an asset of almost unlimited value. It is desirable that these waterways, of which portions have been surveyed or improved for purposes of navigation, should be further investigated with a view to the systematic development of interstate commerce in coordination with all other uses of the waters and benefits to be derived from them.

2. While the railways of mainland United States have been notably efficient in extending and promoting the production and commerce of the country, it is clear that at seasons recurring with increasing frequency they are unable to keep pace with production or to meet the requirements of transportation. Railway congestion. C. R.

3. While navigation of the inland waterways declined with the increase in rail transportation during the later decades of the past century, it has become clear that the time is at hand for restoring and developing such inland navigation and water transportation as upon expert examination may appear to confer a benefit commensurate with the cost, to be utilized both independently and as a necessary adjunct to rail transportation. Waterway navigation. A. W. L.

4. While the decline of navigation in the inland waterways was largely due to the natural growth and legitimate competition attending railway extension, it is also clear that railway interests have been successfully directed against the normal maintenance and development of water traffic by control of water-fronts and terminals, by acquisition or control of competing canals and vessels, by discriminating tariffs, by rebates, by adverse placement of tracks and structures, and by other means. Railway competition. C. R.

5. Any complete or practically successful plan for the general improvement of waterways must eventually provide for satisfactory adjustment of the relation of rail lines to such waterways. Since present and prospective railways reach all parts of the country while navigable Railways. Waterways.

waterways are confined to certain natural lines, it is clear that railways can so control transportation as to leave the waterways insufficient traffic to support the requisite vessels and terminals. The railways have accordingly, save in certain exceptional cases, substantially absorbed the traffic of the country, and unless the present unrestricted and short-sighted competition between the two systems is intelligently adjusted they will continue to do so. So large a portion of railway traffic is free from water competition that railways can readily afford to so reduce rates on those portions affected by such competition as to destroy the profits of the water lines without appreciably affecting the profits of the rail systems which recoup these reductions by higher rates elsewhere. This has been the case with most of the great inland waterways, excepting the Great Lakes where the conditions of water and traffic approach those of open seas. In spite of the great increase of traffic and the continued improvement of waterways, the total river traffic of the country has steadily decreased both proportionately and absolutely, with the result that few rivers are used to anything approaching their full capacity. It will not relieve traffic congestion to improve our waterways unless the improved waterways are used; hence it is obvious that relief from the existing congestion by waterway improvement can be made permanently effective only through such coordination of rail and water facilities as will insure harmonious cooperation rather than injurious opposition.

C-E, I.

Commercial data.

6. Existing data as to the nature and amount of the internal commerce of the country are extremely meager and incomplete. Such information is essential to the intelligent treatment of the inland waterways, and it is desirable that means be employed to obtain it.

E.

Purification.

7. Improvements of navigation in inland waterways in the main affect favorably the purity of the waters and the regularity of the supply, and these objects should be carefully kept in mind. The increasing pollution of streams by soil wash and other waste substances connected with a growing population reduces the value of the water for manufacturing purposes, and renders the water supply for communities injurious to and often destructive of human life. The prevention of these evils should be considered in any scheme of inland waterway improvement.

A, H-I.

Regimentation.

8. Engineering works designed to improve navigation affect favorably the regimen of the streams, including floods and low waters. The annual floods of the United States occasion loss of property reaching many millions of dollars with considerable loss of life, while the low water of late summer involves large loss in diminished water supply, in reduced power, and in the fouling of streams with consequent disease and death. It has been claimed that in specific cases the cost of works required both to control floods and meet the needs of commerce would be less than the amount of this loss. It is desirable that more detailed information be collected concern-

A, F-I.

ing the effects of floods and low waters and their prevention by engineering works and other devices.

Erosion.

9. The annual soil wash in mainland United States is estimated at about 1,000,000,000 tons, of which the greater part is the most valuable portion of the soil; it is carried into the rivers where it pollutes the waters, necessitates frequent and costly dredging, and reduces the efficiency of works designed to facilitate navigation and afford protection from floods. The direct and indirect losses from this source have not been measured, but are exceedingly large; and it is desirable that definite determinations be made with the view of devising means for reducing the loss to the land and preventing the impairment of the streams for purposes of commerce.

A. F-1

Cultivation.

10. Both the regimen of streams and the purity and clarity of waters are affected by forests and other natural growth, and by farming, mining, and other industrial operations over the watersheds in which they gather. Millions of acres in mainland United States have been deforested unnecessarily, and the floods and low waters ascribed to this cause have in some localities occasioned losses commensurate with the value of the timber. Means should be devised and applied for coordinating forestry, farming, mining, and related industries with the use of streams for commerce and for other purposes.

A. F-2

Fluctuation.

11. The effect of wide variations in the level of navigable streams is to render difficult the establishment of necessary terminals for the handling of traffic, and thus to interfere seriously with the utilization of our inland waterways. The prevention or mitigation of such variations would be most helpful to the revival of river traffic, and means to this end should be adopted in plans for waterway improvement.

A. F-3

Irrigation.

12. The storage of flood waters combined with the diversion of streams to arid and semiarid lands for purposes of reclamation by irrigation, greater canals and laterals to clarify the waters and increase the storage of return waters during times of drought. There have already been put under irrigation over 11,000,000 acres of fertile land, adding a quarter of a million homes and several hundred million dollars of taxable wealth; and it is estimated that by fully conserving the waters and by utilizing the water power developed in connection with storage and other works, fully three times as much land can be reclaimed in the western half of the United States. It is desirable to continue the collection of data with a view to so adjusting irrigation and power development with navigation and other uses of the streams as to secure the highest value of the water to the greatest number of people.

A. F-4

Power.

13. Locks and certain other works designed to improve navigation commonly produce head and store water in such manner as to develop power available for industrial purposes, while works designed to develop power on navigable and source streams affect the navigation and other

waterways are confined to certain natural lines, it is clear that railways can so control transportation as to leave the waterways insufficient traffic to support the requisite vessels and terminals. The railways have accordingly, save in certain exceptional cases, substantially absorbed the traffic of the country, and unless the present unrestricted and short-sighted competition between the two systems is intelligently adjusted they will continue to do so. So large a portion of railway traffic is free from water competition that railways can readily afford to so reduce rates on those portions affected by such competition as to destroy the profits of the water lines without appreciably affecting the profits of the rail systems which recoup these reductions by higher rates elsewhere. This has been the case with most of the great inland waterways, excepting the Great Lakes where the conditions of water and traffic approach those of open seas. In spite of the great increase of traffic and the continued improvement of waterways, the total river traffic of the country has steadily decreased both proportionately and absolutely, with the result that few rivers are used to anything approaching their full capacity. It will not relieve traffic congestion to improve our waterways unless the improved waterways are used; hence it is obvious that relief from the existing congestion by waterway improvement can be made permanently effective only through such coordination of rail and water facilities as will insure harmonious cooperation rather than injurious opposition.

C-E, I.

Commercial data.

6. Existing data as to the nature and amount of the internal commerce of the country are extremely meager and incomplete. Such information is essential to the intelligent treatment of the inland waterways, and it is desirable that means be employed to obtain it.

E.

Purification.

7. Improvements of navigation in inland waterways in the main affect favorably the purity of the waters and the regularity of the supply, and these objects should be carefully kept in mind. The increasing pollution of streams by soil wash and other waste substances connected with a growing population reduces the value of the water for manufacturing purposes, and renders the water supply for communities injurious to and often destructive of human life. The prevention of these evils should be considered in any scheme of inland waterway improvement.

A, H-I.

Regimentation.

8. Engineering works designed to improve navigation affect favorably the regimen of the streams, including floods and low waters. The annual floods of the United States occasion loss of property reaching many millions of dollars with considerable loss of life, while the low water of late summer involves large loss in diminished water supply, in reduced power, and in the fouling of streams with consequent disease and death. It has been claimed that in specific cases the cost of works required both to control floods and meet the needs of commerce would be less than the amount of this loss. It is desirable that more detailed information be collected concern-

A, F-I.

ing the effects of floods and low waters and their prevention by engineering works and other devices.

9. The annual soil wash in mainland United States is estimated at about 1,000,000,000 tons, of which the greater part is the most valuable portion of the soil; it is carried into the rivers where it pollutes the waters, necessitates frequent and costly dredging, and reduces the efficiency of works designed to facilitate navigation and afford protection from floods. The direct and indirect losses from this source have not been measured, but are exceedingly large; and it is desirable that definite determinations be made with the view of devising means for reducing the loss to the land and preventing the impairment of the streams for purposes of commerce. Erosion. A. F-1

10. Both the regimen of streams and the purity and clarity of waters are affected by forests and other natural growth, and by farming, mining, and other industrial operations over the watersheds in which they gather. Millions of acres in mainland United States have been deforested unnecessarily, and the floods and low waters ascribed to this cause have in some localities occasioned losses commensurate with the value of the timber. Means should be devised and applied for coordinating forestry, farming, mining, and related industries with the uses of streams for commerce and for other purposes. Cultivation. A. F-2

11. The effect of wide variations in the level of navigable streams is to render difficult the establishment of necessary terminals for the handling of traffic, and thus to interfere seriously with the utilization of our inland waterways. The prevention or mitigation of such variations would be most helpful to the revival of river traffic, and means to this end should be adopted in plans for waterway improvement. Fluctuation. A. F-3

12. The storage of flood waters combined with the diversion of streams to arid and semiarid lands for purposes of reclamation by irrigation creates canals and also tends to clarify the waters and increase the volume of return waters during times of drought. There have already been put under irrigation over 10,000,000 acres of fertile land, adding a quarter of a million homes and several hundred million dollars of taxable wealth; and it is estimated that by fully conserving the waters and by utilizing the water power developed in connection with storage and other works, fully three times as much land can be reclaimed in the western half of the United States. It is desirable to continue the collection of data with a view to so adjusting irrigation and power development with navigation and other uses of the streams as to secure the highest value of the water to the greatest number of people. Irrigation. A. F-4

13. Locks and certain other works designed to improve navigation commonly produce head and store water in such manner as to develop power available for industrial purposes, while works designed to develop power on navigable and source streams affect the navigation and other Power.

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A, H-I. by soil wash and other waste substances connected with a growing population reduces the value of the water for manufacturing purposes, and renders the water supply for communities injurious to and often destructive of human life. The prevention of these evils should be considered in any scheme of inland waterway improvement.

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Cultivation.

10. Both the regimen of streams and the purity and clarity of waters are affected by forests and other natural growth, and by farming, mining, and other industrial operations over the watersheds in which they gather. Millions of acres in mainland United States have been deforested unnecessarily, and the floods and low waters attributed to this cause have in some localities increased losses commensurate with the value of the timber. Means should be devised and applied for coordinating forestry, farming, mining, and related industries with the uses of streams for commerce and for other purposes.

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Irrigation.

12. The storage of flood waters combined with the diversion of streams to arid and semiarid lands for purposes of reclamation by irrigation creates ponds and basins to clarify the waters and increase the seepage or return waters during times of drought. There have already been put under irrigation over 21,000,000 acres of fertile land, adding a quarter of a million homes and several hundred million dollars of taxable wealth, and it is estimated that by fully conserving the waters and by utilizing the water power developed in connection with storage and other works, fully three times as much land can be reclaimed in the western half of the United States. It is desirable to continue the collection of data with a view to so adjusting irrigation and power development with navigation and other uses of the streams as to secure the highest value of the water to the greatest number of people.

Power.

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A. F-I. uses of river systems; and these uses must necessarily be considered together. Information concerning water power in the several States and sections is incomplete, yet it is known to be a vast and intrinsically permanent asset which should be utilized for the benefit of the people of the country, in whose interests it should be administered with careful regard for present and prospective conditions. The facts ascertained in certain specific cases furnish a basis for the claim that the value of the power would pay the cost of all engineering and other works required in such cases to control the streams for navigation and other uses. In the light of recent progress in electrical application, it is clear that over wide areas the appropriation of water power offers an unequaled opportunity for monopolistic control of industries. Wherever water is now or will hereafter become the chief source of power, the monopolization of electricity produced from running streams involves monopoly of power for the transportation of freight and passengers, for manufacturing, and for supplying light, heat, and other domestic, agricultural, and municipal necessities, to such an extent that unless regulated it will entail monopolistic control of the daily life of our people in an unprecedented degree. There is here presented an urgent need for prompt and vigorous action by State and Federal governments.

Reclamation. 14. Any comprehensive system of improvement of inland waterways will necessarily affect the drainage or reclamation of swamp and overflow lands, which are mainly rich alluvial tracts largely along or near waterways. The construction of dikes and levees or bank-protective works and the deepening of channels are often closely connected with means of control both of overflow and of underflow by drainage. It is estimated that there are 77,000,000 acres of such land, now unproductive, but which with drainage and protection from overflow will have an exceptionally high agricultural value; if divided into 40-acre farms these lands will furnish homes for some 10,000,000 people.

A. F-I.

Coordination. 15. The control of waterways on which successful navigation depends is so intimately connected with the prevention of floods and low waters, and works designed for these purposes; with the protection and reclamation of overflow lands, and works designed therefor; with the safeguarding of banks and maintenance of channels, and works employed therein; with the purification and clarification of water supply, and works designed therefor in conjunction with interstate commerce; with control and utilization of power developed in connection with works for the improvement of navigation; with the standardizing of methods and facilities and the coordinating of waterway and railway instrumentalities; and throughout the larger area of the country with reclamation by irrigation and drainage, and works designed primarily for these purposes—that local and special questions concerning the control of waterways should be treated as a

A. F-I: II.

general question of national extent, while local or special projects should be considered as parts of a comprehensive policy of waterway control in the interests of all the people.

Organization.

18. Governmental agencies whose work is related to the use and control of streams are now in existence in the Federal Departments of War, Interior, Agriculture, and Commerce and Labor, and it is desirable in order to prevent duplication of work and function and to avoid unnecessary delays in the development of the inland waterways that means should be provided for coordinating all such agencies.

Belief of commission.

19. While precise figures are not now obtainable, it is safe to say that the current value of our inland transportation facilities of which railways form all but a small percentage exceeds one-third of our national wealth; yet these facilities are so far inadequate that production is impaired and the growth of the country is retarded. While trustworthy estimates can not be made without further data, it is reasonable to anticipate that conservation of inadequate commerce can be invested in large measure by judicious improvement of waterways adapted to large and local traffic, at a figure much less than that estimated by competent authorities for an increasing railway facilities as to meet present needs. It is desirable that additional data be obtained by adequate expert investigation.

Benefits.

20. It is conservative to estimate that judicious improvement of the waterways of the country will confer direct benefits through increased transportation facilities which will exceed the cost, while the collateral benefits will be at least comparable with the gain to commerce. Under a coordinated plan, such collateral benefits as the enhanced value of lands reclaimed by irrigation and drainage, the value of water power developed, the increased values due to the protection of lands and low waters, and the great benefits of purified and clarified water, will more than balance the cost of the works.

Conclusion.

21. In a comprehensive system of waterway improvement and control designed to meet present and future needs, the practicability of any project will depend not alone on local and general demands of commerce, but necessarily on economic factors and conditions, including factors of lands and soil, suitability of the ground as a foundation for works, volume of water and liability to floods and low stages, conformation of the watershed and its susceptibility to control by judicious agriculture and forestry or by reservoirs and other means, local and general demand for pure water supply, amount and value of available water power incident to the works, proximity and cost of structural materials, relations to existing and prospective projects in the same and neighboring watersheds, and all other physical and economic factors entering into or tending to counteract the cost; and the local surveys or plans for any project should take account of all such factors and conditions.

conditions and be adapted to the attainment of maximum benefits at the minimum cost.

Physical data. F. 20. Existing data concerning the volume, regimen, and other physical features of most streams are meager and imperfect. Since plans for improving and controlling the waterways and utilizing the waters must rest on these facts, it is desirable that means be employed to extend and perfect physical data relating to the navigable and source streams of the country.

Distribution. B, I: I, II. 21. The benefits of a comprehensive system of waterway improvement will extend to all the people in the several sections and States of the country; and the means employed should be devised so far as possible to distribute the cost equitably through cooperation between Federal agencies, States, municipalities, communities, corporations, and individuals.

Administration. B, H, I: I, II. 22. In order to improve the inland waterways for navigation and at the same time coordinate the agencies and means of transportation, develop the collateral benefits of waterway improvement, adapt all natural and industrial conditions related with waterways to the attainment of maximum benefits at the minimum cost, and perfect means for distributing the cost equitably between Federal agencies, States, municipalities, communities, corporations, and individuals in a prompt and efficient and economical manner, it is desirable to maintain an administrative agency with large powers for the investigation and elaboration of projects under suitable legislative regulation.

Conservation. G : I. 23. The immediate use of natural resources in the rapid development of the country are often allowed to stand in the way of more beneficient and permanent utilization. This is especially true of all resources connected with running waters, the substantial value of which has not been adequately appreciated. It is clearly practicable, without undue expense or interference with current use, to carry out broad plans for the complete development of the resources of the country, and thus assure to the greatest number of people the greatest good for both the present and the future; while if this is not done the temporary or partial development of these resources will prevent their full utilization for the general benefit. Steps should be taken without delay to outline and initiate the more pressing projects of conservation, and to apply practically the principle of conservation before it is too late.

Regulation G, I : I. 24. Our unsurpassed natural wealth and the eagerness of our people for immediate results regardless of future needs have led to a policy of extravagant consumption of national resources and to an encouragement of monopoly, whereby an excessive share of such resources has been diverted to the enrichment of the few rather than preserved for the equitable benefit of the many. Monopolistic tendencies have appeared (*a*) in the extensive control of mineral fuels on public lands, whereby large values

1-5. tion with interstate commerce shall take full account of transfer facilities and sites, and of the location of tracks, grades, bridges, dams, depots, and other works on navigable and source streams with a view to equitable cooperation between waterway and railway facilities for the promotion of commerce and the benefit of the people.

Railways: waterways. D. We recommend that any plans for improving the inland waterways shall take account of the present and prospective relation of rail lines to such waterways, and shall ascertain so far as may be whether such waterways when improved will be effectively used in the face of railway competition; and that the relations between railways and waterways be further examined with the purpose of devising means of rendering the two systems complementary and harmonious and making such fair division of traffic that rates and management may be coordinated economically and with benefit to the country.

5.

Commercial data. E. We recommend the adoption of means for ascertaining regularly all facts related to traffic on the inland waterways, and for publishing the same in a form suitable for general use.

6.

Physical data. F. We recommend the adoption of means for ascertaining and rendering available, at such rate as to meet public necessities, all requisite data related to the physical character and general utility of the navigable and source streams of the country.

20.

Conservation and regulation. G. We recommend that hereafter any plans for the use of inland waterways in connection with interstate commerce shall regard the streams of the country as an asset of the people, shall take full account of the conservation of all resources connected with running waters, and shall look to the protection of these resources from monopoly and to their administration in the interests of the people.

23, 24: I, II.

Relief of congestion. H. We recommend that the Congress be asked to make suitable provision for improving the inland waterways of the United States at a rate commensurate with the needs of the people as determined by competent authority; and we suggest that such provision meet these requisites, viz: expert framing of a definite policy; certainty of continuity and coordination of plan and work; expert initiative in the choice of projects and the succession of works; freedom in selection of projects in accordance with terms of cooperation; and the widest opportunity for applying modern business methods.

1-5, 17, 22: III.

Legislation. I. We recommend that the Congress be asked to authorize the coordination and proper development of existing public services connected with waterways; and we suggest that such enactment might provide that the President of the United States be authorized, with the advice and consent of the Senate, to appoint and organize a National Waterways Commission to bring into coordination the Corps of Engineers of the Army, the Bureau of Soils, the Forest Service, the Bureau of Corporations, the Reclamation Service, and other branches of the pub-

1-24: A-H.

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Among the reasons for such a conference are the following:

1. Hitherto our national policy has been one of almost unrestricted disposal of natural resources, and this in more lavish measure than in any other nation in the world's history; and this policy of the Federal Government has been shared in by the constituent States. Three consequences have ensued: First, unprecedented consumption of natural resources; second, exhaustion of these resources, to the extent that a large part of our available public lands have passed into great estates or corporate interests, our forests are so far depleted as to multiply the cost of forest products, and our supplies of coal and iron ore are so far reduced as to enhance prices; and third, unequaled opportunity for private monopoly, to the extent that both the Federal and State sovereignties have been compelled to enact laws for the protection of the people.

2. We are of opinion that the time has come for considering the policy of conserving these material resources on which the permanent prosperity of our country and the equal opportunity of all our people must depend; we are also of opinion that the policy of conservation is so marked an advance on that policy adopted at the outset of our national career as to demand the consideration of both Federal and State sponsors for the welfare of the people.

3. We are of opinion that the conference may best be held in the national capital next winter, and that the conferees should comprise the governors of all our States and Territories, a limited number of delegates to be appointed by each governor, and representatives from leading organizations of both State and national scope engaged in dealing with natural resources or with practical questions relating thereto.

We have the honor to ask that in case you concur in our view you call such a conference.

Respectfully submitted.

THEODORE E. BURTON,
Chairman.

W J MCGEE,
Secretary.

In his Memphis address on October 4 the President announced the intention of calling such a conference, and on November 13 he issued invitations to the governors of the States and Territories to meet at the White House May 13-15, 1908; the conferees to comprise also three assistants or advisors to be selected by each governor; the Senators and Representatives in the Sixtieth Congress; the members of the Inland Waterways Commission, and representatives of certain national organizations dealing with natural resources. The Commission anticipates from the deliberations of this conference results of the utmost value as regards both conditions and policies.

Coordination.

II. The clauses in the same instrument declaring that "the time has come for merging local projects and uses of the inland waters in a comprehensive plan designed for the benefit of the entire country," and that "such a plan should consider and include all the uses to which streams may be put," has received attention; and while the consideration resulted in several of the foregoing findings and recommendations, the time and means at the disposal of the Commission have been wholly insufficient to frame a comprehensive plan extending in detail to all the waterways of the country. The task is large, and is affected by projects for improving waterways and opening canals for navigation and other purposes which are now

15, 21, 22 A. I.

received attention and has resulted in the eighth and ninth of the foregoing Recommendations; yet pending the recommendation of the "comprehensive plan" alluded to in the preceding paragraph, it would be premature to submit estimates of cost.

IV. The suggestion that "the reports of the Commission shall include both a general statement of the problem and recommendations as to the manner and means of attacking it" has received consideration and has led to the foregoing Findings and Recommendations. The Commission is, however, fully aware of the incompleteness of this report, and is desirous of continuing investigation and discussion with a view to further action.

Continuation.

V. It is to be understood that the inquiries and conclusions herein are of general character, and that the mention of any stream or project does not involve expression of opinion as to the desirability or practicability of doing work upon it.

Qualification.

Respectfully submitted.

THEODORE E. BURTON,
Chairman.
FRANCIS G. NEWLANDS.
WM. WARNER.
J. H. BANKHEAD.
W J MCGEE.
F. H. NEWELL.
GIFFORD PINCHOT.
HERBERT KNOX SMITH.

SUPPLEMENTARY REPORT OF COMMISSIONER GENERAL ALEXANDER MACKENZIE

1. As a member of the Inland Waterways Commission, I am in accord with the general principles enunciated as proper for consideration in connection with the preparation of plans for improvement and control of inland waterways; and with recommendations which advise suitable provision for continuing the improvement of inland waterways at a rate commensurate with the requirements of commerce; and, so far as justifiable, with cooperation between Federal agencies and States, municipalities, and communities with a view to a distribution of costs and benefits; and I am in accord with a suggestion that in the carrying out of examinations and surveys and in the making of plans of improvement of inland waterways, such consideration be given by the War Department to the subject of water power, floods and low water, drainage, and such other related subjects as may have a bearing upon the improvement of navigation and such as Congress, in its wisdom, may provide for.

2. I am in the fullest accord with recommendations looking to the protection to the greatest extent of the natural resources of the country, both in their relation to the interests of navigation and in the interest of multiplying prosperous homes; and I am in accord with the thought of utilizing such resources in every legal and proper way with a view to recompensing the Government for expenditures made in carrying out improvements.

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An ample fund should be provided, to be reinforced from time to time either by legislative appropriation or by bond issue, and the administrative board or commission should be given the power, not only to investigate projects, but also, when determined to be feasible, to enter, with the approval of the President, upon their immediate execution; but the power should be limited so as to prevent such administrative body from entering into any contract unless there are sufficient unappropriated moneys in the fund to meet the cost thereof.

Unless some method of construction and development, insuring prompt decision and execution and continuous and consecutive work by a body of experts is adopted, I fear that the best of projects may be wrecked in the shoals and quicksands of legislation.

FRANCIS G. NEWLANDS.

APPENDIX

The greater portion of the appended statistical and other papers including numbers 1 to 10, inclusive, were prepared in the office of the Bureau of Corporations and were revised by Commissioner Smith. The remaining papers were prepared either in accordance with the desire of the Commission or at the request of individual Commissioners or the experts under whose names they appear.

It has been the purpose in the preparation of these papers to bring together statistical and other information in a form convenient for reference.

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[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

a stream, such stream has been divided into sections. In the second column is given the distance between the terminals of such sections, the names of the points so connected appearing in column 3. In the fourth column appears the total navigable length of the stream so far as could be learned from official sources. In the fifth column is given the depth at low water, in feet, of the stream under consideration. In case such depth varies between different points the variation is shown in connection with data appearing in columns 2 and 3. Column 6 of the table gives the freight tonnage of each stream by periods as reported by the Government engineers. Where such commerce over different sections of the stream possesses special characteristics, these are indicated in connection with data appearing in columns 2 and 3. Column 7 contains the names of transportation companies operating on a given stream, but not, as a rule, the names of individual vessel owners. Finally, in the eighth column, under the head of "Remarks" appear striking facts connected with a given stream, which have been largely compiled from the reports of the United States Chief of Engineers.

GENERAL PHYSICAL CHARACTERISTICS OF NAVIGABLE STREAMS

The physical characteristics of the more important members of the several great natural groups of rivers are as follows:

A. Tributaries to the Atlantic.—Streams draining the Atlantic slope descend from the highlands and mountains of the great Appalachian system (the Green and White mountains, Adirondacks, Alleghenies, etc.) and flow into the ocean after traversing the plains and valleys intervening between the mountainous regions and the sea. Few of these streams connect with one another, being isolated by the topography of the country. Of the Atlantic tributaries only one, the Hudson River, possesses much national importance. In their geographical sequence, proceeding from north to south, the important streams of this system are as follows: In New England may be mentioned the Penobscot, Kennebec, Saco, Piscataqua, Merrimac, Connecticut, and Housatonic. Of these the most important is the Connecticut, which in connection with Long Island Sound provides a water route between New York City, Hartford, and other points in the State of Connecticut. Farther south is the Hudson, which has already been mentioned. This river, which the Erie Canal unites at Buffalo with the Great Lakes, forms a link in the vast system of inland navigation whose extreme points are Duluth and Chicago in the West and New York City in the East. The Hudson River, in connection with the Champlain Canal and Lake Champlain, also affords a water route between New York City and various points in Canada reached by the Richelieu River and the Canadian Chambly Canal.[a]

The Delaware River, on which is situated Philadelphia, the Susquehanna, the Potomac, flowing past Washington, and the James, whose head of navigation is at Richmond, 104 miles from the mouth, are not navigable above tidewater for the reason that the four streams cross what is known as the "fall line."[b] The Potomac and James are navigable for ocean-going vessels through improvements made

[a] Vétillart, La Navigation aux États Unis, pp. 78–81.
[b] Johnson, Ocean and Inland Water Transportation, 1906, p. 327.

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ing from its confluence with the Missouri, some 20 miles above St. Louis, to St. Paul; and the lower Mississippi, from the mouth of the Missouri to New Orleans.

The Ohio River is formed at Pittsburg, now the most important river town in the country, by the confluence of the Allegheny and Monongahela rivers. The total length of the Ohio from Pittsburg to Cairo is 967 miles, and on its course to the Mississippi the Ohio receives a number of important tributaries, which for the most part are navigable naturally and on which through communication exists in consequence of improvements made by the Government, by States, or by private enterprise. Most of these tributaries flow from the south. The Great Kanawha of West Virginia contributes much to the coal traffic of the Ohio. Other important tributaries are the Tennessee, Cumberland, Kentucky, and Muskingum. The Ohio is also connected by the Ohio and Erie canal with Lake Erie. As shown in Table 3, the Ohio River has a larger traffic than the Mississippi and traverses a rich section whose agriculture and industries are highly developed. An enormous tonnage originates at Pittsburg and along the Monongahela and Allegheny rivers above that city. The Ohio receives at Pittsburg coal from the rich fields of Pennsylvania and West Virginia and takes it, together with iron and steel products, to Cincinnati, Louisville, and other portions of the Mississippi Valley, including New Orleans. There is some movement of sugar upstream.

Of the tributaries to the Mississippi, exclusive of those connected with the Ohio, the longest is the Missouri, which has lost its former importance. Another tributary of importance is the Illinois, jointly improved by the Government and by the State of Illinois. Farther south important Mississippi tributaries include the Arkansas, Ouachita, Yazoo, and Red.

E. Tributaries to the Pacific.—The Pacific tributaries, as shown on the map, are not so numerous as those composing the two other groups. Like the Atlantic tributaries, they fail to connect with one another so well as those of the Gulf territory. In California important rivers flowing into San Francisco Bay are the San Joaquin and the Sacramento, both of which reach the valley of California.

The most important river of the Pacific coast is the Columbia, with its two principal affluents, the Willamette and the Snake. Until several years ago navigation of the Columbia was obstructed by the falls in the river at the Cascades. By means of a canal and locks this obstruction has been overcome by the Government and the stream made navigable as far as The Dalles, about 250 miles from the ocean. Freight carried to this point is now transported around the rapids in the river by means of a portage road, but the Government has begun the construction of a system of locks, which, with the canal—about 5 miles long—is expected to provide an all-water route from the mouth of the Columbia to Priests Rapids, in Washington, more than 500 miles from the sea. A number of streams tributary to Puget Sound are of value for both navigation and logging purposes, but all appear to be liable to the obstructions generally found in streams flowing through a heavily wooded country. Among these tributaries are the Skagit and its tributaries, the Snohomish, the Snoqualmie, and the Stillaguamish.[a]

[a] Chief of Engineers' Report, 1905, p. 697.

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TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Kennebec, Me.		Mouth to Augusta, Me.	44.0		1897, 665,991 tons.	Augusta and Bath S. S. Co., Knickerbocker Steam Towage Co., Eastern Steamship Co.	Maritime navigation: Augusta is at the head of general navigation, but above the dam at that place the stream admits navigation in a limited way. The river and harbor act of 1886 provided for a survey of the river from Bath to Augusta. This was made in 1887 and a project to dredge, excavate, and otherwise improve river adopted, and in 1892 revised. This work completed in 1898.
		Mouth to Sands Island.		13.0	1898, 1,211,808 tons.		
		Sands Island to Hinckleys Shoal.		12.0	1899, 714,199 tons.		
					1900, 716,930 tons.		
		Hinckleys Shoal to Augusta, Me.		10.0	1901, 542,626 tons.		
					1902, 431,118 tons.		
					1903, 499,849 tons.		
					1904, 468,980 tons.		
					1905, 400,735 tons.		
Songo, Me.		Sebago Lake, Me., to Long Pond, Me.	7.0				
Damariscotta, Me.		Mouth to New Castle and Damariscotta, Me.	15.0	5.0	No statistics.		Tidal estuary.
Saco, Me.		Mouth to Biddeford, Me.	5.0	3.5	1901, 42,625 tons.		
					1902, 38,072 tons.		
					1903, 33,879 tons.		
					1904, 39,730 tons.		
					1905, 48,537 tons.		
Kennebunk, Me.		Mouth to Kennebunkport, Me.	1.16	4.0	1904, 2,000 tons.		The commerce consists principally of coal. An occasional vessel brings in lumber for the shipyards, of which there are two at this port.
					1905, 2,000 tons.		
Cocheco, N. H.		Mouth to Dover, N. H.	13.0	6.5	1901, 199,890 tons.		Commerce consists chiefly of coal and building material.
					1902, 121,000 tons.		
					1903, 200,526 tons.		
					1904, 229,629 tons.		
					1905, 182,930 tons.		
Exeter, N. H.		Mouth to Exeter, N. H.	8.3		No statistics.		
		Mouth to Oxbow, N. H.		12.0			
		Oxbow to Exeter.		11.0			
Otter Creek, Vt.		Mouth to Vergennes, Vt.	8.0	8.0	1896, 9,052 tons.		Commerce consists of coal and lumber.
					1903, 5,300 tons.		
					1904, 6,150 tons.		
					1905, 7,180 tons.		
Merrimac, Mass.		Mouth to Haverhill, Mass.	17.5	7.0	1903, 65,400 tons.	Merrimac River Towing Co.	Improvement reported to have enabled the delivery of coal by water at rates 35 to 50 cents less per ton than by rail.
					1904, 76,527 tons.		
					1905, 88,324 tons.		

Dover, Mass		Mouth to Lincolnville, Mass	8.0	12.0	1914, 10,000 tons	Commerce consists of coal for local consumption.
	1.0	Continuous with North Jaw to Lincolnville, Mass.				
Rome, Mass		Mouth to Rome, Mass	4.0	1.0 to 4	No statistics	No freight is carried on the river; the improvement is for the purpose of permitting the cart of about 30 fishing schooners which are built annually on the river.
Medfield, Mass		Continuous with Charles River to Medfield, Mass	8.0		1912, 22,000 tons 1914, 28,000 tons	Reported that as the smallest barges go out of use, the improvement will permit barges to deliver coal in Medfield without the expense of lighterage, which would be about 50 cents a ton.
		Mouth to Dunning's Wharf		3.3	1913, 31,244 tons	
		Dunning's Wharf to Medfield		1.3		
Malden, Mass		Continuous with Mystic to Malden, Mass	1.0	10.0	1914, 73,000 tons 1913, 70,000 tons	The improvement is reported to enable the smallest barges or larger barges with parts of cargoes to deliver coal at Malden, saving the cost of lighterage, 50 cents a ton.
Charles, Mass		Boston to Watertown	8.0	8.0	1914, 112,000 tons 1913, 107,000 tons	Improvements said to enable coal to be delivered without breaking cargoes at Boston, thus saving the cost of one handling and the greater cost of bringing the coal by rail. Commerce consists chiefly of coal.
Chelsea Creek, Mass		Continuous with Mystic to bridge of B. & M. R. R.	0.7	14.0	1912, 10,000 tons 1914, 4,000 tons 1913, 4,700 tons	
Weymouth Fore, Mass		Mouth to East Braintree, Mass	8.0		1912, 92,700 tons 1914, 95,400 tons	Improvement chiefly important to the Fore River Shipbuilding Co., with the extensive plant at Quincy Point, where large steamers, cruisers, and battleships were constructed in 1914.
		Mouth to Weymouth Fore River bridge		10.0	1913, 108,000 tons	
		Weymouth Fore River bridge to East Braintree		8.0		
Weymouth Back, Mass		Continuous with Town River to East Braintree	4.0	10.0	1912, 132,000 tons 1914, 104,000 tons 1913, 148,000 tons	American Agricultural Chemical Co. appears to be largely benefited by these improvements; 95 per cent of the commerce in 1914 was raw and manufactured fertilizer products. In 1904, 85 per cent of the commerce was stone; in 1913, 75 per cent of it was stone.
Town, Mass		Continuous with Weymouth Fore to Quincy, Mass	1.8	4.0	1913, 60,000 tons 1914, 48,000 tons 1913, 23,000 tons	
Taunton, Mass		Mouth to Taunton, Mass	12.8		1914, 800,000 tons 1913, 800,000 tons	Rockport Granite Co., McWilliams Bros., United States Transportation Co., Boston and Philadelphia Steamship Co., Peoples Coal Co., Enterprise Navigation Co.,

* High water

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Taunton, Mass. (con.)						Dyer Transportation Line, New England Navigation Co., Joy Line, Staples Coal Co.	
Providence, R. I.		Mouth to Providence, R. I.	7.0	25.0	1903, 2,640,006 tons. 1904, 2,659,173 tons. 1905, 3,214,248 tons.	Providence Steamboat Co., McWilliams Bros., Enterprise Transportation Co., F. W. Munn, Providence, Fall River and Newport Steamboat Co., Boston and Philadelphia Steamship Co., Merchants and Miners Transportation Co., Dyer Transportation Line, New England Navigation Co., Joy Line.	Improvements have been of great benefit to commerce.
Pawtucket, R. I.		Pawtucket to Providence, R. I.	4.0	12.0	1904, 229,835 tons. 1905, 286,637 tons.		This river, a portion of which is called Seekonk River, is the upper portion of the Providence River, the navigable portion extending from Pawtucket to Providence. The effect of improvement is said to be the use of vessels of deeper draft than formerly, larger cargoes, and cheaper rates.
Pawcatuck, R. I., Conn.		Westerly, R. I., to Stonington, Conn.	7.5	6.0	1896, 39,086 tons. 1898, 131,602 tons. 1900, 57,530 tons. 1902, 116,399 tons. 1903, 108,802 tons. 1904, 141,832 tons. 1905 167,668 tons.		Improvements said to permit coal, lumber, and building material to be delivered in vessels at Westerly, and to ship granite therefrom in vessels instead of by rail.
Thames, Conn.		Mouth to Norwich, Conn.	15.0	14.0	1896, 424,945 tons. 1898, 459,568 tons. 1900, 464,283 tons. 1902, 355,074 tons. 1903, 409,997 tons. 1904, 346,791 tons. 1905, 446,004 tons.	New England Navigation Co., Thames Towboat Co., American Towing and Lightering Co., McWilliams Bros., Montauk Steamboat Co., Ltd. (L. I. R. R. Co.), Fishers Island Navigation Co.	Maritime commerce: Commerce at Allyns Point is coal, and at Norwich and intermediate landings, coal, lumber, cotton, wool, and general steamboat freight. Improvements said to reduce cost of transportation by enabling freight to be brought in vessels of 16 to 18 feet draft instead

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Harlem, N. Y.		East River to Hudson River.	8.0	15.0	1903, 6,910,386 tons. 1904, 9,130,763 tons. 1905, 9,998,021 tons.		The greater part of the commerce is handled by the N. Y., N. H. and H. R. R. Co. The effect of improvement is a slight reduction in freight rates.
Hudson, N. Y.		New York City to Troy.	150.00		1905,[a] 112,677 tons	North River Steamboat Co., Newburg and Haverstraw Steamboat Co., Hudson River Day Line, Mary Powell Steamboat Co., Central Hudson Steamboat Co., Saugerties and New York Steamboat Co., Cornell Steamboat Co., Albany Towing Co., Catskill and New York Steamboat Co., Murrays Line of Troy, N. Y., Ben Franklin Transportation Co., Hillside Coal and Iron Co. (Erie R. R.), Pennsylvania Coal Co., Hudson Navigation Co., Mortons Peekskill-New York Day Line.	General statement made that the effect of improvements is to reduce freight rates during the navigation season. (1) Traffic of Hudson includes, in addition to the proper traffic, which is considerable, the movement of merchandise as follows: (*a*) Erie canal, which enters the river at Troy and Albany. (*b*) Champlain canal, which enters directly at Waterford and by the Erie Canal at Troy and Albany. Several railway companies parallel the river. The two principal local industries which furnish traffic on the Hudson are the cutting of ice and the manufacture of bricks. The ice houses constructed along the Hudson can hold millions of tons of ice, while millions of bricks are manufactured along the banks of the river. Every part of the section to New Baltimore is naturally navigable. Rondout is about 90 miles above New York and was one of the terminals of the old Delaware and Hudson Canal. (2) That portion of the stream beginning at the State dam at Troy and extending downstream to Coxsackie is being improved by the Government. The improvement provides for a 12-foot channel 150 feet wide, gradually increasing to 400 feet wide at the foot of Broadway, Troy, thence 400 feet to Coxsackie. No figures for general commerce of whole river.
	125.0	New York to New Baltimore, N. Y.		11+	1904,[a] 11,3200 tons. 1905,[a] 81,600 tons.		
	20.0	New Baltimore to Albany, N. Y.		11.0	1904,[b] 81,265 tons. 1905,[b] 74,546 tons.		
	5.0	Albany to Troy, N. Y.		9.0	1905,[c] 71,201 tons. 1904,[d] 3,513,545 tons. 1905,[d] 3,310,628 tons.		

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
South, N. J.		Mouth to Oldbridge, N. J.	6.3	6.0	1899, 343,202 tons. 1900, 414,288 tons. 1901, 328,186 tons. 1902, 387,246 tons. 1903, 333,890 tons. 1904, 392,626 tons. 1905, 260,204 tons.		This is a small stream in the central part of New Jersey which empties into the Raritan River about 8 miles from its mouth. Large brickyards established along the banks of the river give it a commercial importance out of proportion to its size. From reliable information received it appears that as the result of improvement a reduction in freight rates on fire brick by rail to Boston of from $3.25 to $2 per ton has been made. Freight rate by rail to New York said to be $1.60, and 75 cents by water.
Elizabeth, N. J.		Mouth to Elizabeth, N. J.	2.75	a 4.0	1895, 21,650 tons. 1896, 30,066 tons. 1897, 28,865 tons. 1901, 29,495 tons. 1902, 40,250 tons. 1903, 37,136 tons. 1904, 36,336 tons. 1905, 28,887 tons.		Commerce: Coal, building material, and miscellaneous freight. Statement made that reduction in freight rates probably due to improvements.
Shoal Harbor and Compton Creek, N. J.		Mouth to railroad bridge.	1.0	3.5	1900, 179,500 tons. 1901, 180,000 tons. 1902, 48,790 tons. 1903, 65,175 tons. 1904, 28,570 tons. 1905, 34,340 tons.		The harbor is on the south side of Raritan Bay and the creek is a narrow stream flowing into it. The creek is navigable for about 1 mile above its mouth, where it is crossed by a railroad bridge without a draw. Statement made that there has been a reduction on coal freights of 40 per cent; on manure from 40 to 50 per cent; and on fish 20 per cent, as a result of improvement.
Cheesequake Creek, N. J.		Mouth to point on creek.	3.5	4.0	1886, 50,000 tons. 1905, 45,500 tons.		This is a small stream in eastern New Jersey which discharges into Raritan Bay about 2 miles east of South Amboy, N. J. Commerce is principally in bricks, clay, and farm produce.

Rhiewsbury, N. J.			17.0		1880, 900,000 tons	Metropolitan Steamboat Co of New Jersey	This river is a large tidal basin in the eastern part of New Jersey, consisting of two bays designated as North Branch (Navesink River) and South Branch. The two branches are united by a channel called the Main Stem, which extends to the outlet at the southeast end of Sandy Hook Bay.
North Branch	8.0	Mouth to first bank		6.0	1900, 804,000 tons		
South Branch	6.0	Mouth to Branchport		6.0	1901, 488,000 tons		
					1902, 687,000 tons		
					1903, 701,000 tons		
					1904, 700,000 tons		
					1905, 1,018,000 tons		
Manamquan, N. J.		Mouth to point on river	7.95	9.0			The river is used by small fishing craft; also by pleasure boats during the summer season.
Rancocas, N. J.		Mouth to forks	7.0	5.0	1903, 109,071 tons	Rancocas & Mount Holly Transportation Co	The Rancocas River is a tributary of the Delaware River, its mouth being about 11 miles above Camden, N. J.
Mount Holly Branch.			5.5	9.0			
Lumberton Branch			3.0	6.0			
Cooper Creek, N. J.		Mouth to point on creek	9.0	5.0	1903, 414,838 tons		Important shippers: Brewerling a Chemical Works and Campbell Iron Works. Freight rates said to have been reduced by permitting larger vessels to be used for long voyages.
Mantua Creek, N. J.		Mouth to Mantua, N. J.	11.25		1903, 130,105 tons		Improvements reported to have reduced freight rates on car floats 25 per cent. The phosphate works of I. P. Thomas & Sons Co. are located on this stream.
		Mouth to phosphate works		10.0			
		Phosphate works to Paulsboro		5.0			
		Paulsboro to Parkers Landing		2.0			
Alloway Creek, N. J.		Mouth to Quinton, N. J.	10.0	5.0	1901, 60,150 tons 1905, 60,150 tons		This is a tidal tributary of the Delaware River, its mouth being about 50 miles below Camden, N. J. Freight rates said to have been lowered by reason of the improvement of the creek. Larger boats are enabled to enter and delays in waiting for tides are avoided.
Tuckerton Creek, N. J.		Mouth to Tuckerton, N. J.	3.0	2.5	1901, 17,330 tons 1905, 15,417 tons		This is a tidal stream flowing into Little Egg Harbor on the Atlantic coast northeast of Atlantic City.
Raccoon Creek, N. J.	..	Mouth to Swedesboro, N. J.	8.75	5.0	1904, 202,300 tons 1905, 203,317 tons		This creek rises in Gloucester County, flows in a northwesterly direction, and empties into the Delaware River at a point nearly opposite Marcus Hook, Pa.

* High water.

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Delaware, N. J., Pa., Del.	.....	Mouth (Bombay Hook Point to Cohansey Lighthouse) to Trenton, N. J. (Information furnished by Coast and Geodetic Survey.)	82.0	.....	1903,[a] 7,171,139 tons. 1904 [a] 7,441,017 tons. 1905,[a] 8,545,135 tons. 1903,[b] 11,716,231 tons. 1904,[b] 12,321,606 tons. 1905,[b] 12,205,752 tons.	Clyde Steamship Co., Charles Warner Co., Trenton Transportation Co., Scully's Towing and Transportation Line, Staples Coal Co., Philadelphia and Reading Transportation Line (Philadelphia and Reading Railway Co.), Coastwise Transportation Co., Frederica and Philadelphia Navigation Co., Rancocas and Mount Holly Transportation Co., Delaware River Transportation Co., Smyrna Transportation and Manufacturing Co., Boston and Philadelphia S. S. Co., Merchants and Miners' Transportation Co., Wilmington Steamboat Co., B. & S. Transportation Line, Baltimore and Philadelphia S. S. Co., F. W. Munn, Canal and Back Creek Towing Co., Charles Gring, The Red Star tugs, James McCaulley, Dempsey & Sons, Philadelphia Transportation and Lighterage Co., Cook-Cummer S.S. Line, Southern and Eastern Transportation Co., Atlantic Coast Lumber Corporation, Southern Steamship Co.	Maritime and domestic commerce: Philadelphia is on the Delaware about 105 miles from the mouth of Delaware Bay and a little above the confluence of the Schuylkill and Delaware. The port is formed by the confluence of these two rivers but principally by the Delaware, whose lower course is a fine channel for maritime navigation. Trenton is the head of navigation and is about 30 miles above Philadelphia. Near Philadelphia connection is made with the Delaware and Raritan Canal and the Chesapeake and Delaware Canal.
		Below Philadelphia	.....	23.1			
		Trenton to Philadelphia:					
		Perriwig Bar	.....	6.0			
		Bordentown through Kinkora Bar.	.....	8.5			
		Five Mile Bar	.....	26.0			
Schuylkill, Pa.	.....	Mouth to Gibsons Point, Pa.	4.0	20.0	.....	.....	Maritime navigation.

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Patapsco, Md		Mouth to Baltimore, Md	11.0	30.0	[a] 1890, 4,237,361 tons. [a] 1900, 7,941,580 tons. [a] 1905, 7,510,713 tons. [a] 1906, 8,277,098 tons.	F. W. Munn, Merchants and Miners Transportation Co., Coastwise Transportation Co., Baltimore and Carolina Steamship Co., Baltimore Steampacket Co., Rock Creek Steamboat Co., Baltimore and Philadelphia S. S. Co., Tolchester Beach Improvement Co., American Towing and Lightering Co., Canal and Back Creek Towing Co., The P. Dougherty Co. of Baltimore City, Consolidation Coal Co., Atlantic Coast Lumber Corporation, Greenleaf Johnson Lumber Co.	Maritime and domestic navigation. Baltimore is situated on the Patapsco River, which opens into the great Chesapeake Bay. The city is 171 miles from the mouth of Chesapeake Bay. Baltimore is one of the principal ports for the export of the agricultural products of the West, and is the head of lines of strong railroads and steamboat companies.
Elk, Md		Mouth to Elkton	16.0	3.5	1905, 26,446 tons.	Canal and Back Creek Towing Co.	Reported that improvement has lowered freight rates.
Chester, Md		Mouth to Jones Landing, Md.	39.25	5.0	1904, 48,463 tons. 1905, 49,163 tons.	Chester River Line	Commerce mainly agricultural products. Improvements said to have made no change in freight rates.
Choptank, Md		Mouth to Greensboro, Md	46.0	7.0	1903, 208,367 tons. 1904, 210,447 tons. 1905, 212,725 tons.	Tolchester Beach Improvement Co., Choptank River Line.	Improvement appears to have made no appreciable difference in freight rates. The Choptank is one of the largest tributaries of Chesapeake Bay.
Warwick (Secretary Creek), Md.		Mouth to Secretary Landing, Md.	2.0	9.0	1903, 65,206 tons. 1904, 65,858 tons. 1905 66,631 tons.		This river is a small tidal basin flowing into Choptank River, with no fresh-water influx at the head.
Pocomoke, Md		Mouth to Snow Hill, Md	28.0	9.0	1903, 245,568 tons. 1904, 246,223 tons. 1905, 67,165 tons.	Pocomoke River Line	Improvements said to have made no appreciable difference in freight rates.
La Trappe (Dividing Creek), Md.		Mouth to Trappe Landing, Md.	3.0	6.5	1903, 11,466 tons. 1904, 13,601 tons. 1905, 13,848 tons.		Improvements said to have made no appreciable difference in freight rates.

Manokin, Md.	Mouth to Princess Anne, Md.	[illegible]	[illegible]	[illegible]		Improvement and clearing made navigable. Little or no improvement in freight rates. Complete commercial statistics not available. Tonnage reported at from [illegible] to [illegible] per year.
Pocomoke River (Nanticoke River), Md.	Mouth to Pocomoke, Md.	[illegible]	[illegible]	1907 [illegible] tons 1909 [illegible] tons 1910 [illegible] tons		Slightly less freight rates.
Wicomico, Md.	Mouth to Salisbury, Md.	[illegible]	[illegible]	1907 [illegible] tons 1909 [illegible] tons 1910 [illegible] tons	Wicomico River Line	
Choptank, Md.	Mouth to Federal Landing, Md.	[illegible]	[illegible]	No statistics	Choptank River Line	Commerce mainly farm products and general merchandise. Improvement appears to have made no alteration in freight rates, although facilitating shipments.
Nanticoke, Md.	Mouth to Seaford, Del.	[illegible]	[illegible]	1907 [illegible] tons 1909 [illegible] tons 1910 [illegible] tons	Nanticoke River Line	Improvement has made considerable reduction in freight rates.
Potomac, D. C. to Va.	Mouth to Washington, D. C.	[illegible]	[illegible]	1907 [illegible] tons 1909 [illegible] tons 1910 [illegible] tons	Potomac Navigation Co., Washington and Potomac Steamboat Co., New York and Washington Steamboat Co., Potomac River Line (has freight consolidation deal with Southern and Eastern Transportation Co.)	Washington and Georgetown are situated on the Potomac River at the point where maritime commerce begins and about 100 miles from the entrance to Chesapeake Bay and 115 miles from Point Lookout, where the Potomac flows into the Chesapeake Bay. Connection is made at Georgetown with the Chesapeake and Ohio Canal. The Potomac is a wide and deep body of water having the characteristics of a tidal estuary rather than a fluvial stream. The river is navigable to the foot of Little Falls, 3 miles above Georgetown, but the Aqueduct Bridge obstructs navigation. Commerce: Coal, lumber, wood, sand, gravel, clay, stone, oil, asphalt, and general merchandise.
Anacostia (Eastern Branch), D. C.	Mouth to Bladensburg, Md. (Mouth to Navy Yard Bridge)	[illegible]	[illegible]	1907 [illegible] tons 1909 [illegible] tons 1910 [illegible] tons		A large amount of freight is shipped to and from the naval proving grounds at Indian Head, Md. The river is navigable for large vessels to the Navy Yard Bridge, for tugs and small vessels to Pennsylvania Avenue Bridge, for small scows and lighters to Bladensburg. Commerce: Sand, gravel, brick, stone, oil, tar, lumber, asphalt, and general merchandise.

* Fiscal year ending June 30.

TABLE 1.—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles		*Miles.*	*Feet.*			
Rappahannock, Va		Mouth to Fredericksburg, Va.	106.0	7.5	1888, 83,600 tons. 1892, 126,333 tons. 1895, 151,466 tons. 1898, 166,586 tons. 1900, 190,827 tons. 1903, 268,803 tons. 1904, 395,202 tons. 1905, 430,626 tons.	Rappahannock River Line.	Commerce: Ties, grain, oysters, farm produce, wood, fertilizer, lumber, flour, canned goods, and general merchandise. Understood that freight rates have been reduced by improvements.
York, Va		Mouth to West Point, Va	41.0	20.0	1888, 285,480 tons. 1890, 418,190 tons. 1894, 379,808 tons.	York River Line (Chesapeake Steamship Co.).	Maritime navigation: The York River is formed by the confluence of the Mattaponi and Pamunkey rivers. Report is that freight rates have been somewhat lowered since improvements. No complete commercial statistics since 1902. One line of steamers carried 62,150 tons in 1903. Much additional freight carried by other steamers, sailing vessels, barges, etc. Commerce: Farm products, general merchandise, and tobacco.
Mattaponi, Va		West Point to Aylett, Va	39.0	2.4	1890, 32,650 tons. 1894, 39,300 tons. 1899, 44,700 tons. 1904, 43,400 tons.		Commerce: Farm products and general merchandise. Freight rates said to have been reduced since improvements.
Pamunkey, Va		West Point to Hanovertown, Va.	59.0		1893, 50,420 tons. 1894, 42,250 tons.		Improvements said to have facilitated shipments and reduced freight rates. No late commercial statistics available.
		West Point to Bassett Ferry, Va.		5.3	1899, 44,600 tons.		
		Bassett Ferry to Wormley Landing.		3.5			
		Wormley Landing to Hanovertown.		2.2			
James, Va		Mouth to Richmond, Va	103.8	16.0	1904, [a] 273,609 tons. 1905, [a] 288,745 tons. 1904, [b] 250,437 tons. 1905, [b] 316,017 tons.	Easton and McMahon Transportation Co., Howell & Perry Towboat Co., Marshall Towing Co. (Inc.), Joseph M. Clark & Co., Hancock & Hastings, Old Dominion Steamship Co., Coastwise Transportation Co., Virginia Navigation Co.	River freights to James River points said to be constantly lowering the rail rate. Commerce: Brick, coal, cement, cord wood, fish, timber, oil, and general packet freight.

Chickahominy, Va		Mouth to Forge Bridge, Va	40.0	8.0			
Appomattox, Va		Mouth to Petersburg, Va	11.0	28.0	1888, 31,000 tons 1893, 103,000 tons 1894, 40,945 tons 1895, 51,300 tons	R. P. Tinsley	The Upper Appomattox Co. controls this river for about 70 miles above Petersburg, Va
Staunton, Va		Brookneal to Randolph Station Brookneal to Pig Station	30.0 30.0	3.0 9.0	No statistics		Mostly pole-boat navigation
Dan, Va			77.0	1.5	do		do
Thompson Creek, Va		Mouth to Thompson, Va	8.0	5.7	1891, 8,300 tons 1892, 30,700 tons 1894, 8,000 tons 1895, 60,400 tons 1896, 50,000 tons 1897, 100,400 tons		Improvements said to have facilitated shipments and materially reduced freight rates. Commerce: Coal, stone, sand, railroad ties, timber, coal, and general merchandise
Nandua Creek, Va		Mouth to Nandua Wharf, Va	4.0	6.0	1890, 8,500 tons 1891, 1,107 tons 1893, 5,000 tons 1894, 5,110 tons		Commerce: Farm products, fish, and general merchandise
Aquia Creek, Va		Mouth to Wharton's Landing, Va.	7.5	6.0	(4)		Commerce: Timber and its products and farm produce. Improvements have been of material benefit to shippers, and freight rates are understood to have been somewhat reduced and shipments facilitated.
Carters Creek, Va		Mouth to 1 mile beyond Irvington, Va	3.5		1895, 43,000 tons		Improvements said to have no effect on freight rates. Commerce: Oysters, fish, fertilizer, timber, flour, farm produce, and general merchandise
	1.5 1.0	Mouth to Irvington Irvington to 1 mile beyond		19.0 5.0			
Nomini Creek, Va		Mouth to 3 miles above Nomini Ferry	8.0	9.0	1890, 11,340 tons 1891, 15,800 tons 1893, 60,300 tons 1895, 13,940 tons 1896, 7,450 tons 1897, 32,400 tons 1898, 9,110 tons 1899, 11,450 tons	Washington and Potomac Steamboat Co	Reported that improvements have considerably reduced freight rates. Commerce: Farm products, lumber, oysters, and general merchandise
Urbana Creek, Va		Mouth to point on river	4.0	8.5			Improvement of much benefit to commerce and navigation. New industries are being established along the stream and the commerce is increasing. Urbana Creek is a tributary of the Rappahannock River.

[1] At Richmond. [2] At other points. [3] High water. [4] 18,000 to 30,000 tons annually.

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Pagan, Va.		Mouth to Smithfield, Va.	9.0	10.0	1901, 108,058 tons. 1902, 75,614 tons. 1903, 120,121 tons. 1904, 85,128 tons. 1905, 82,207 tons.		Volume of commerce depends on whether the conditions have been or have not been favorable for the production of peanuts and oysters.
Nansemond, Va.		Mouth to Suffolk, Va.	18.0	11.0	1888, a110,000 tons. 1904, 22,119 tons. 1905, 77,204 tons.		Commerce consists principally of lumber and general merchandise.
Elizabeth, Va.		From Hampton Roads to confluence of Southern and Eastern Branches.	9.0	28.0	1904, 11,173,439 tons. 1905, 12,323,657 tons.	Clyde Steamship Co., Norfolk and Washington Steamboat Co., Baltimore Steam Packet Co., Merchants and Miners' Transportation Co., American Towing and Lightering Co., Atlantic Coast Lumber Corporation, Southern and Eastern Transportation Co., LeRoy Steamboat Co., Howell & Perry Towboat Co., Albemarle and Chesapeake Towing Co., Marshall Towing Co., Inc., Joseph M. Clark & Co., Hancock & Hastings, Greenleaf Johnson Lumber Co., Old Dominion Steamship Co., Merchants and Miners' Transportation Co.	Southern Branch forms part of inland water routes from Norfolk to Albemarle Sound, via Canals. Norfolk and Portsmouth on Elizabeth River are situated at the entrance of Chesapeake Bay and near the mouth of the James River. Norfolk forms the northern terminus of a double line of inland navigation, part natural, part artificial, which connects Chesapeake Bay with Albemarle Sound, by means of Currituck Sound, by parts of Chesapeake and Albemarle Canal, by means of the Pasquotank River, on the other hand with the Dismal Swamp Canal. The Southern Branch has a depth of 28 feet to the navy-yard, and 10 feet above. The Western Branch has 20 feet for 1 mile and 4 feet for the remaining 8.
Southern Branch		From mouth to lock in canal.	11.0	8 to 10			
Eastern Branch		Mouth to point on river.	5.0	22.0			
Western Branch		Mouth to point on river.	9.0	20 to 4			
North, N. C.		Norfolk, Va., to Albemarle Sound.	67.0	9.0	1890, 403,111 tons. 1905, 88,580 ons.	Bennett Ferry Co., Banks Line.	Part of waterway consisting of Southern Branch of Elizabeth River, Albemarle and Chesapeake Canal, North Landing River, Currituck Sound, Coinjock Bay, Noith Carolina Cut and North River.
Perquimans, N. C.		Mouth to Newby's Bridge, N. C.	26.0	.....	1902, 36,000 tons.	Albemarle and Cheaspeake Towing Co., LeRoy Steamboat Co.	
		Mouth to Hertford		9.0	1904, 38,300 tons. 1905, b 50,375 tons.		

Chowan, N. C.	Mouth to point on river	30.0	6.0		Albemarle Steam Navigation Co.	This river empties into the western part of Albemarle Sound from northwest and with its tributaries is one of the largest rivers in North Carolina. For a distance of 17 miles above its mouth the river has an average width of about 1½ miles. There are no artificial aids to navigation on this river or its tributaries.
Meherrin, N. C.	Mouth to Murfreesboro	8.0	7.0		Albemarle Steam Navigation Co.	The Meherrin joins the Chowan from westward about 21 miles above Winton.
Blackwater, Va.	Mouth to Franklin, Va.	11.0	8.0		Albemarle Steam Navigation Co.	The Blackwater is the continuation of the Chowan taking this name in Virginia.
Nottoway, Va.	Mouth to Minnie Ferry	19.0	11 to 5			When the water is not too low, vessels of a foot draft can navigate the river up to the ferry.
Alligator, N. C.	Mouth to point on river	30.0			Fairfield and Elizabeth City Transportation Co.	Alligator River empties into Albemarle Sound from the southward. Near the head of navigation a canal connects the river with Lake Mattamuskeet. The river affords an outlet for rafts of logs.
	18 Mouth to 18th mile		8 to 11			
	5 18th mile to 23d mile		8.0			
	7 23d mile to 30th mile		6.0			
Roanoke, N. C.	Mouth to Weldon, N. C.	130.0		1901, 470,181 tons	Lofty Steamboat Co., Greenleaf Johnson Lumber Co., Roanoke River Line (N. & S. Ry. Co.)	The Roanoke River is formed by the confluence of the Dan and Staunton Rivers at Clarksville.
	Mouth to Hamilton, N. C.		10.0	1902, 163,804 tons		
				1903, 114,878 tons		
	Hamilton to Weldon, N. C.		4.0	1904, 89,700 tons		
				1905, 70,055 tons		
Roanoke, N. C.	Mouth to Sprunts Bridge, N. C.	53.0	7.0	1903, 40,314 tons	Lofty Steamboat Co., Roanoke River Line (N. & S. Ry. Co.)	Commerce: Coal, lumber, timber, cotton and other farm products.
				1904, 51,473 tons		
				1905, 53,173 tons		
Fishing Creek, N. C.	Mouth to Beech Swamp, N. C.	17.0	2.0	1903, 4,000 tons		This stream when open for navigation affords an outlet for farm products, timber, lumber, etc., which have no other outlet except by wagon.
				1904, 1,800 tons		
				1905, 2,300 tons		
Pamlico and Tar, N. C.	Mouth to Dunbars Bridge, N. C.	100.0	8.0	1903, 845,377 tons	F. W. Mann, C. L. Pennington & Co., Pamlico River Line (N. & S. Ry. Co.)	The upper portion of this river called Tar, the lower portion Pamlico. Improvement of the river is said to have a tendency to keep down freight rates.
	Washington to Greenville, N. C.		2.0	1904, 814,401 tons		
				1905, 807,331 tons		
Contentnea Creek, N. C.	Mouth to Speights Bridge, N. C.	*30.0	3.0	1903, 13,849 tons		Effect on freight rates can not be stated, but the stream, when open to navigation, affords an outlet for farm products, timber, lumber, etc., which have no other outlet except by wagons.
				1904, 16,010 tons		
				1905, 21,820 tons		

*Approximate. †Estimated. *Not complete.

* Snow Hill, 34½ miles from mouth of river, is practically head of navigation. During high water boats can go to Speights Bridge.

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Neuse, N. C.		Mouth to Waynesboro Landing, N. C.	136.0		1903, 491,736 tons. 1904, 501,751 tons. 1905, 469,399.	F. W. Munn, Charles Gring, Independent Steamboat Co., Vanceboro Steamboat Co., R. E. Pitman, Newbern and Bayboro Steamboat Line, John L. Roper Lumber Co.	Statement made that freight rates have been materially lessened since improvement. At Newbern there is a means of navigation, part natural, part artificial, to Beaufort, including Neuse River, Newbern and Beaufort Canal, Clubfoot Creek, Harlowe Creek, and Newport River.
		Mouth to Newbern.		8.0			
		Newbern to Village Creek.		4.0			
		Village Creek to Contentnia Creek.		2.5			
		Contentnia Creek to Kinston.		1.0			
Trent, N. C.		Mouth to Trenton, N. C.	38.0	3.0	1903, 251,055 tons. 1904, 284,935 tons. 1905, 262,135 tons	Independent Steamboat Co.	
New, N. C.		Mouth to Tar Landing	26.0	4.0	1903, 6,177 tons. 1904, 5,812 tons. 1905, 15,798 tons.		Stream affords transportation for produce which otherwise would have no outlet except by wagon.
Northeast, N. C.		Mouth to Kornegays Bridge, N. C.	103.0		1903, 102,183 tons. 1904, 105,800 tons. 1905, 111,979 tons.		Commerce consists of timber, naval stores, fertilizers, cotton, general merchandise, and farm products.
	48.0	Mouth to Bannermans Bridge, N. C.		6.0			
	8.0	Bannermans Bridge to Crooms, N. C.		3.0			
Black, N. C.		Mouth to Lisbon, N. C.	74.0		1903, 74,123 tons. 1904, 72,677 tons. 1905, 68,635 tons.	Carolina Transportation Co.	Commerce: Farm and forest products, naval stores, and general merchandise.
	24.0	Mouth to Point Caswell, N. C.		5.0			
	8.0	Point Caswell to Haws Narrows, N. C.		2.5			
	34.0	Haws Narrows to Clear Run, N. C.		1.5			
Cape Fear, N. C.		Mouth to Fayetteville, N. C.	145.0		1903, 1,000,029 tons. 1904, 1,006,027 tons. 1905, 1,010,807 tons.	Baltimore and Carolina S. S. Co., Carolina Transportation Co., Wilmington, Southport and Little River Co., Wilmington, Southport and Carolina Beach Line.	Wilmington is on the Cape Fear River, about 30 miles from its mouth (Ocean Bar). Navigation on lower river is maritime. Improvements below Wilmington result in vessels much larger than formerly coming to Wilmington and causing a decrease in freight rates on shipments by water.
	30.0	Mouth to Wilmington, N. C.		20.0			
	38.0	Wilmington to Kings Bluff, N. C.		8.0			
	35.0	Kings Bluff to Elizabethtown, N. C.		2.5			
	42.0	Elizabethtown to Fayetteville, N. C.		2.0			

TABLE 1—*Rivers tributary to Atlantic Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Edisto, S. C		Mouth to Guignard Landing.	260.0		[a] 1894-95, 177,000 tons.		
South Edisto, S. C			11.0				Projected inland waterway between Charleston and Beaufort, S. C., includes projected canal between South Edisto, Ashepoo, Wappoo Cut, and improvements across Ashley River Bar.
Beaufort, S. C		Beaufort to Coosaw River, S. C.	11.0	7.0	1902, 65,668 tons. 1903, 22,835 tons. 1904, 7,881 tons.	Beaufort and Savannah Line.	Will be part of a projected inland waterway connecting Beaufort and Charleston, S. C.
Savannah, Ga			250.0		1904, 61,353 tons. 1905, 55,700 tons.	Merchants and Miners Transportation Co., Ocean Steamship Co. of Savannah, Gibson Line, Augusta and Savannah Steamboat Co.	Improvements caused a reduction of from 30 to 50 percent in freight rates. Traffic movement also included 107,000 bushels of rice and in 1904, 28,430,400 feet B. M. of timber; in 1905, 25,000,000 feet B. M. of timber.
	202.0	Savannah to Augusta		3.0			
	48.0	Augusta to Petersburg, Ga.		(b)			
Altamaha, Ga		Mouth to Forks	131.0	2.0	1904, 4,500 tons. 1905, 13,000 tons.	Brunswick, St. Simons and Darien Steamboat Co., Altamaha Navigation Co.	This river is formed by the junction of the Oconee and Ocmulgee rivers; 25 miles from the mouth the river branches and traffic reaches the ocean by two routes, one by way of Brunswick, Ga., and one by way of Darien, Ga. Both are important points for shipping lumber. Traffic movement also included rafted timber as follows: 1904, 109,255,356 feet B. M.; 1905, 85,063,110 feet B. M.
Oconee, Ga		Mouth to Milledgeville, Ga.	147.0		1904, 32,160 tons. 1905, 20,375 tons.		Milledgeville only reached during high stages of water. At ordinary stages river is navigable 25 miles above Dublin, Ga., 104 miles from the mouth. Traffic movement also included rafted timber as follows: 1904, 60,237,440 feet B. M.; 1905, 47,758,038 feet B. M.
	104.0	Mouth to 25 miles above Dublin, Ga.		2.5			
	43.0	From there to Milledgeville, Ga.		1.5			

Ocmulgee, Ga		Mouth to Macon, Ga	300.0		[a] 1904, [illegible] tons		Head of navigation, Macon, Ga., but river not navigable, except at high water above Hawkinsville, 133 miles from the mouth. This condition has been improved somewhat. A line of steamers has been put into operation between Macon and Brunswick, Ga. Improvements said to have caused a reduction of from 25 to 40 percent in freight rates. Traffic movement also included rafted timber as follows: 1904, 23,513,000 feet B. M.; 1905, 33,888,936 feet B. M.
	133.0	Mouth to Hawkinsville, Ga		4.0	[b] 1905, 34,000 tons		
	80.0	Hawkinsville to Macon, Ga		3.0			
St. Marys, Fla., Ga		Mouth to Charlton Hill, Ga	97.0			St. Marys River Steamboat Co	Fernandina, Fla., situated on Cumberland Sound near the mouth of St. Marys River.
	4.0	Mouth to St. Marys		18.0			
	97.0	St. Marys to Colerain		14.0			
St. Johns, Fla.		Mouth to Lake Washington, Fla	270.0		[c] 1900, 404,474 tons [c] 1901, 640,991 tons [c] 1902, 903,101 tons [c] 1903, 1,059,070 tons [c] 1904, 1,000,310 tons [c] 1905, 1,400,047 tons	Clark Commerce R. R. Co., Florida Fish and Produce Co., Naval Stores Steamboat Co	It is stated that improvements so far effected have resulted in a freight rate to local points very much less than it would otherwise have been
	37.5	Mouth to Jacksonville, Fla		20.0			
		Jacksonville to Palatka, Fla		13.0			
	102.0	Palatka to Volusia Bar		0.0	[d] 1900, 1,004,810 tons [d] 1903, 1,377,000 tons [d] 1904, 1,000,003 tons [d] 1905, 1,317,000 tons		
Chiwaola, Fla		Mouth to Leesburg, Fla	94.0		1900, 4,847 tons		Commerce is small. Boats using the river are chiefly excursion steamers which run during the winter months.
	53.0	Mouth to Silver Spring River		4.0	1901, 4,530 tons		
Indian, Fla		Coral Creek to Jupiter Inlet	100.0	3.0	1901, 60,003 tons 1902, 61,875 tons		Indian River is used only by small local steamers, launches, and sailing vessels. The through line of steamers which formerly ran has been taken off, being unable to compete with the railroad which parallels the river. The length of the river is taken from the Standard Dictionary.

[a] Fiscal year. [b] Flat boat. [c] Mouth to Jacksonville. [d] Entire river.

TABLE 2.—*Rivers tributary to Gulf of Mexico*

[Exclusive of the Mississippi and its tributaries]

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Kissimmee, Fla		Kissimmee to Fort Bassinger	99.5	1.25	1901, 3,670 tons. 1902, 9,655 tons. 1903, 10,652 tons. 1904, 2,863 tons. 1905, 9,911 tons.		Improvements said to have lowered freight rates by enabling steamers to run more months in the year than formerly. Freight is hauled in wagons when steamboats are not running, there being no railroads down the valley. The Kissimmee rises in Tohopekaliga Lake, flows southward through Cypress Lake and Lake Kissimmee, and empties into Lake Okeechobee. Lake Okeechobee is connected with the Caloosahatchee River, thus giving a navigable waterway of several hundred miles across Florida. Commerce consists of cattle, fruit, vegetables, fish, and general merchandise.
		South of Kissimmee		3.0			
Caloosahatchee, Fla		Puntarassa to Fort Thompson.	50.5		1899, 33,101 tons. 1900, 22,737 tons. 1902, 27,895 tons. 1903, 27,576 tons. 1904, 12,255 tons. 1905, 9,577 tons.	Caloosahatchee River Steamboat Line.	The junction of the upper course of the Caloosahatchee with Lake Okeechobee was undertaken for the purpose of draining the neighboring lands of Lake Okeechobee by the Atlantic and Gulf Coast Canal and Okeechobee Land Co., incorporated under the laws of Florida. This junction was effected by means of a canal which was utilized at the same time for navigation. The Atlantic Coast Line was extended from Punta Gorda to Fort Myers, May, 1904. Said to have resulted in abandonment of the steamship line. Commerce consists of fruit, vegetables, cattle, lumber, and general merchandise.
		Mouth to Fort Myers		7.0			
		Fort Myers to Fort Thompson.		4.0			
Orange, Fla		Mouth to Middle Bridge, Fla.	4.0	4.0	1896, 1,250 tons. 1902, 7,155 tons. 1903, 8,555 tons. 1904, 3,099 tons. 1905, 2,074 tons.		Statement made that freight rates are the same as before improvement. This stream empties into the Caloosahatchee about 6 miles above Fort Myers and is about 6 miles in length.

Ivan, Fla		Mouth to point on river	[illegible]		[illegible]	Equipped with portable-type rail of Pittsburgh Harbor [illegible] Coast Pilot No. VIII, page 40.
	[illegible]	Mouth to point on river		[illegible]		
Manatee, Fla		Mouth to bar, Fla	[illegible]		[illegible]	Improvements said to have no effect on freight rates. Commerce: Fruit, vegetables, fishes, earth, limestone, metal ores, and general merchandise.
		Tampa Bay to Ellenton, Fla		[illegible]	[illegible]	
		Ellenton to Bradenton, Fla		[illegible]	[illegible]	
		Bradenton to Myakka River, Fla		[illegible]	[illegible]	
		Myakka River to bar, Fla		[illegible]	[illegible]	
Anclote, Fla		Mouth to Tarpon Springs, Fla	[illegible]		[illegible]	Freight rates have been lowered about 50 per cent as a result of improvements. Commerce: Sponges, lime, naval stores, and general merchandise.
		Anclote Anchorage to Sponge Harbor, Fla		[illegible]	[illegible]	
		Sponge Harbor to Anclote Indian County Bridge at Tarpon Springs		[illegible]	[illegible]	
Crystal, Fla		Mouth to Crystal River, Fla	[illegible]	[illegible]	[illegible]	Crystal River is a small tidal estuary emptying into the Gulf of Mexico on the west coast of Florida about 50 miles southeast of Cedar Keys. Freight rates have been reduced about 50 per cent.
Withlacoochee, Fla		Mouth to Pendleton Ferry, Fla	[illegible]		[illegible]	Coal lights at mouth of river to a subpoint of entry. Towards dry tugs both time by exchange basis all the river outcome to European ports with phosphate rock. Freight rates said to have been reduced about 50 per cent since improvements by the Government and Coal lights terminated.
		Pendleton Ferry, Fla, to Coal Lights, Fla		[illegible]	[illegible]	
		Coal Lights to Pendleton Ferry		[illegible]	[illegible]	
Suwanee, Fla		Mouth to Ellaville, Fla	[illegible]		[illegible]	Improvements said to have no effect on freight rates. Only one steamboat now operates on the river regularly.
		Mouth to Hollands Bluff, Fla		[illegible]	[illegible]	
		Hollands Bluff to Branford, Fla, 3 miles below Ellaville, Fla		[illegible]	[illegible]	
Oklockonee, Fla		Mouth to point on river	[illegible]	[illegible]		
Apalachicola, Fla		Mouth to junction of Flint and Chattahoochee rivers	[illegible]	[illegible]		Callahan Lumber et al. About 55 miles from mouth steamboats may have river through the cut off. Lower Chipola and Dry Branch, reaching the river 17 miles farther north, thus making many landings of greater importance than on main river. The country bordering on the Apalachicola is almost entirely dependent upon the river for the transportation of its supplies and products. Commerce consists of cotton, naval

TABLE 2—*Rivers tributary to Gulf of Mexico*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles*	*Feet.*			
Apalachicola, Fla. (continued).							stores, general merchandise, saw logs, and timber for export, and is so combined with that of the Chattahoochee, Flint, and Upper Chipola that a separation is impossible.
Upper Chipola, Fla		Dead Lakes to Sister Islands, Fla	35.0	2.0	1905, 1,758 tons	Callahan Line et al	The section of the country through which this river flows is heavily wooded with long-leaf yellow pine and cypress, which is now being rafted down this stream in large quantities. The total amount of this traffic is reported as 10,000,000 feet B.M. Commerce: Naval stores, round and square timber, lumber, and miscellaneous freight. Combined with Chattahoochee and Flint Rivers.
Flint Ga		Mouth to Albany, Ga	105.0			Callahan Line et al	Between Bainbridge and Newton, 35.75 miles, the river is navigable for light-draft boats. Channel is narrow and obstructed by rocks. The river is navigable all the year from Bainbridge to the mouth, 36 miles; and from Albany to Newton, 33.25 miles. When improvements have been completed the river will be navigable from its mouth to Albany at low water. Traffic movement inseparable from Chattahoochee and Apalachicola rivers. Commerce of Apalachicola, Flint, and Chattahoochee Rivers for 1905, 95,398 tons.
	36.0	Mouth to Bainbridge, Ga.		3.0			
Chattahoochee, Fla., Ga., Ala.		Chattahoochee, Fla., to Columbus, Ga.	223.0	4.0		Callahan Line et al	Improvements said to have given Columbus and all other points on river water rates or a material reduction over rates to all-rail points. Tonnage inseparable from Apalachicola and Flint rivers.

TABLE 2—*Rivers tributary to Gulf of Mexico*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Coosa, Ala., Ga. (con.)							the Coosa, and from the Etowah to the Ocmulgee. This was known as the southern route. The present project is to provide slackwater navigation over the entire river by the construction of 31 locks and dams, 3 of which are completed and 2 nearly so. That section of the river from Wetumpka to Lock 4 is not navigable. Commerce: Cotton, cotton seed, fertilizer, timber, grain, and miscellaneous products.
Oostenaula, Ga. Coosawattee, Ga.		Mouth to Carter's, Ga.	105.0	2.0		Oostenaula and Coosa River Transportation Co.	This river is formed by the junction of the Coosawattee and Connesauga rivers, 56 miles northeast of Rome, Ga. The Oostenaula and its tributary, the Coosawattee, are navigable for light-draft boats nine months in the year.
Mobile, Ala.		Mouth to the confluence of the Alabama and Tombigbee rivers.	45.0	14.0			
Tombigbee, Ala., Miss.		Mouth to Columbus, Miss.	341.0		1904, 270,000 tons. 1905, 286,000 tons.		This river is an important waterway whose traffic appears to be destined to assume additional importance by reason of the rich agricultural and mineral sections which it traverses and which are being rapidly developed. The river is to be improved by the construction of two locks, one of which is nearly completed. It is navigable for rafts to Walkers Bridge, Miss., 69 miles above Columbus, Miss.
	185.0	Mouth to Demopolis, Ala.		6.0			
	156.0	Demopolis, Ala., to Columbus, Miss.		3.0			
Warrior, Ala.		Demopolis to Tuscaloosa, Ala.	140.0	6.0	1904, 25,791 tons.		River is partly canalized. Three more locks and dams are in course of construction and when finished a 6-foot channel will be obtained at low water throughout its entire length. The name Black Warrior refers to that portion of the Warrior above Tuscaloosa.
Black Warrior, Ala.		Tuscaloosa to Daniels Creek, Ala.	14.5	6.0	1905, 15,405 tons.		
			154.5				

Susquehanna, Miss	Mouth to [illegible] branch, Miss	[illegible]		[illegible]	Improvement has effected a reduction in rail rates between Scranton, Miss., and seaboard cities of the Atlantic coast, and also affords direct water freight rates on lumber from Miss Pulpit and Scranton to foreign ports.
	Branch to Dog River	[illegible]	[illegible]	[illegible]	
	Dog River to [illegible] Creek, Miss		[illegible]	[illegible]	
Chickasawhay, Miss	Mouth to Shubuta, Miss	[illegible]	[illegible]	[illegible]	This stream is nontidal and is used only for rafting purposes and flatboats on a rise of 6 or 8 feet. Commerce: mainly logs and naval stores.
Leaf, Miss	Mouth to Beaver Creek	[illegible]	[illegible]	[illegible]	The river is used mainly for rafting purposes and only on a fair rise above low water. Commerce: mainly logs and naval stores.
Pearl, Miss	Mouth to Brookport, Miss	[illegible]	[illegible]	[illegible]	This river has completely changed its character in the last 40 years; from a slow, clear stream it has become a swift, muddy one, and from a good channel with a depth of 5 or 6 feet it is now shallow and much obstructed by logs and drift. Transportation charges by river are reported to be much less than by rail and to some parts of the adjacent country the river affords practically the only means of reaching a market.
	Brookport to Jackson, Miss	[illegible]	[illegible]		
	Jackson to Pelahatchie, Miss	[illegible]	[illegible]		
		[illegible]			
Bogue Chitto, La	Mouth to Point au River	[illegible]	[illegible]	[illegible]	No boats ply regularly on the river. Advantages derived from improvements of the stream were the fall falling of the falling of logs and timber; [illegible] feet [illegible] of pine timber said to be floated down the stream annually. Figures doubtful.
Chifuncte and Bogue Falia, La	Mouth to Covington, La	[illegible]	[illegible]	[illegible]	Secretary of the State railroad commission states that Covington has reduced rates on account of the heavy petition on the river.
Tickfaw, La	Mouth to Kempe Landing	[illegible]	[illegible]	[illegible]	No point on any of these four streams is reached by railroad and there is no competition in freight rates.
Blood River, La	Mouth to Tucker's Landing	[illegible]	[illegible]	[illegible]	
				[illegible]	
Natalbany, La	Mouth to Springfield, La	[illegible]	[illegible]	[illegible]	
Tickfaw, La	Mouth to Wadesboro, La	[illegible]	[illegible]		
Amite, La	Mouth to Hope Villa, La	[illegible]	[illegible]	[illegible]	Secretary of State railroad commission states that Hope Villa has been granted a special tariff with lower than normal rates as a result of improvement on this waterway.
Bayou Manchac, La				[illegible]	
				[illegible]	

* Above Dog River

* Mouth to Dog River

TABLE 2—*Rivers tributary to Gulf of Mexico*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Bayou Plaquemine, La. Grand River, La. Pigeon Bayou, La	.....	Plaquemine, La., to Grand River, La.	11.0	.....	1900, 88,543 tons. 1901, 283,000 tons. 1902, 292,000 tons. 1903, 302,500 tons. 1904, 318,000 tons. 1905, 706,000 tons.	Schwing Lumber and Shingle Co. et al.	Prior to 1867 the largest steamboats could pass Bayou Plaquemine into Grand Lake and other connecting waterways, but at that time the police jury of Iberville Parish closed the bayou by means of a dam, shutting out the waters of the Mississippi. Grand River and Pigeon Bayou were obstructed by snags, logs, overhanging trees, and sand bars. The present plans of improvement include the construction of a lock to connect the bayou with the Mississippi.
Bayou Teche, La	.....	Mouth to St. Martinsville, La.	75.0	4.0	1900, 212,109 tons. 1902, 408,454 tons. 1903, 450,542 tons. 1904, 362,706 tons. 1905, 701,243 tons.	Morgan's Louisiana and Texas R. R. and S. S. Co., Vermilion Transp. Co.	Bayou Teche is an important commercial stream and finds its outlet into the Gulf through the Atchafalaya River.
Bayou Lafourche, La	.....	Mouth to Donaldsonville, La.	105.0	3.0	1899, 157,258 tons. 1900, 210,315 tons. 1901, 137,357 tons. 1902, 132,745 tons. 1903, 94,351 tons. 1904, 66,839 tons. 1905, 94,320 tons.	Louisiana Petroleum Co., Barker Barge Line.	Bayou Lafourche is an outlet of the Mississippi River, forming a junction 70 miles above New Orleans. Navigation is obstructed at present by a dam placed across the head of the bayou at its junction with the Mississipp. River by levee boards of the State of Louisiana, under authority of Act of Congress approved June 30, 1902. By joint resolution of Congress, approved April 13, 1904, the time for removal of this dam was extended to December 13, 1907.
Bayou Terrebonne, La	.....	Mouth to Houma, La	23.0	4.0	.....	Emile D'aigle's Frt. Line, J. O. Arcement, Bradford Transportation Co., Ltd., Pelegrin & Eschete, Wrighter Watkins.	

Atchafalaya, La	Mouth to old Red River, about Red River, La	130.0			Gulf, Baton Rouge, and Atchafalaya Packet Co.; Mississippi River Transportation Co.	The Atchafalaya River is sometimes regarded as the old bed of the Red River. The Mississippi River Commission has undertaken various improvements on this stream, including the rectification of Red and Atchafalaya rivers at their junction with the Mississippi. The opening of Bayou Plaquemine is expected to insure more completely the connection of the Atchafalaya with the Mississippi, thus giving greater transportation facilities.
Mermentau and Vermilion Rivers, La	Mouth to 3 miles above Mermentau	70.0	4.0	1913, 31,190 tons 1914, 33,000 tons		Freight rates are lower at Mermentau than at intermediate points on account of being located on navigable water.
Bayou Nezpique	Mouth to Vidrine, La	35.0	4.0	1914, 40,000 tons		
Bayou Plaquemine Brulé	Mouth to Point on Bayou	10.0	4.0	1914, 45,413 tons		
Bayou des Cannes	do	10.0	4.0			
		115.0				
Vermilion Bayou, La	Mouth to Perrinsville Landing, La	60.0	5.0	1914, 30,190 tons 1915, 30,000 tons		Secretary of the State railroad commission states that at Abbeville there are lower rates than at intermediate points on account of being located on navigable waters.
Calcasieu, La	Mouth to Lake Charles, La	40.0	10.0	1909, 264,394 tons 1911, 30,000 tons 1912, 194,158 tons 1914, 230,010 tons 1915, 300,000 tons	Lake Charles and Cameron Transportation Co.	Lake Calcasieu at the mouth of the river is separated from it by bars which prevent easy communication between the town of Lake Charles and Lake Calcasieu. The lake is 15 miles in length and the bars have been removed. A channel eight feet deep and fifty feet wide connecting deep water in Calcasieu Lake and Pass was dredged between 1904 and 1908, and jetties constructed. This gives deep water connection between Calcasieu Pass and Lake. Points on river and lake enjoy benefits in the way of reduced freight rates due to the fact that they are situated on navigable waters.
Johnson's Bayou, La			9.0	1913, 2,901 tons 1914, 2,013 tons 1915, 4,874 tons		Johnson's Bayou empties into Sabine Lake, Texas.
Sabine, La	Mouth to mouth on river Mouth to Sulphur a bluff	314.0 14.0	8.0	1909, 182,738 tons 1910, 407,374 tons 1914, 202,184 tons 1915, 188,000 tons		This stream is about 400 miles long and for the greater part of its length forms the boundary between the States of Texas and Louisiana

TABLE 2—*Rivers tributary to Gulf of Mexico*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Neches, Tex.		Mouth to Bevilport	135.0	3.0	1904, 161,516 tons. 1905, 253,504 tons.		Empties into the northeastern end of Sabine Lake. Beaumont is the largest city on the river and one of the most important in eastern Texas (U. S. Coast Pilot No. VIII, p. 105). Commerce consists of lumber, cotton, and rice.
Trinity, Tex.		Mouth to Dallas, Tex	511.0				Improvements are under way which will provide six foot navigation from Dallas to the mouth by means of six locks and dams in Section 1, and one lock and dam in Section 2. No commerce of any importance at present.
	35.0	Mouth to Liberty		4.5			
Brazos, Tex		Mouth to Hidalgo Falls, Tex.	260.0	4.0	1905, 8,925 tons		Boats sometimes go, at high water, to Port Sullivan, 339 miles from the mouth.
San Jacinto, Tex. / Buffalo Bayou, Tex.		Galveston to Houston, Tex.	27.0		1904, 106,135 tons. 1905, 104,907 tons.	C. R. Cummings Export Co. Direct Navigation Co.	These streams form part of the waterway connecting Houston with deep water in Galveston Bay. The other links are the Galveston Ship Canal and the Morgan Canal. Channel to be 25 feet deep and from 100 to 150 feet wide on the bottom.
		Mouth to Lynchburg, Tex.		18.5			
		Lynchburg to Harrisburg Bend.		16.0			
		Harrisburg Bend to Houston.		7.5			

TABLE 1 Mississippi River and tributaries

Name of stream and length	Distance between points in miles	Points connected	Navigable public length	Depth at low water	Traffic movement	Transportation companies	Remarks
	Miles		Miles	Feet			
Mississippi River Rivers Ohio Illinois Missouri Arkansas		Minneapolis and Lake Itasca	1,400 [1]				The Mississippi River Commission created by act of Congress June 28, 1879, is in charge of the Mississippi River improvements from the Head of Passes to Minneapolis
	11	Minneapolis to Head of Passes		9 [2]			
	94	Head of Passes to New Orleans		21 [2]		Below New Orleans Ocean vessels running the Eastern Steamship Company, the Red Cross Line, Transportation Company, the Lower Coast Packet Co., Clyde's & Lane Southern Mail Line, H. W. Dunham Sons	New Orleans is situated on the east bank of the Mississippi River 95 miles from the mouth of the river and 6 miles from the point of the bifurcation of the principal outlet of the delta of Mexico. It is the corresponding point for the commerce of the entire river system of the Mississippi Valley and occupies an important position in the present trade of the country. Railroad lines of railroad have added much to the general commerce of the city, the river traffic holds a prominent place. New Orleans possesses a greater number of steamboats and other river craft plying between that city and other points than any other town on the western rivers. In addition to the regular packets and other vessels of the railroad transportation companies and coal barges there are numerous steamers engaged in the local trade.
		New Orleans to Lake Pontchartrain	105 [3]	12 [3]		New Orleans to Lake Pontchartrain	Prior to 1878 Lake Pontchartrain possessed the most commanding site and the best harbor on the Mississippi River. There was deep water along the city front and the entire width of the river was available for steamboats at all stages with not less than a depth of 20 feet in any part of the harbor. The cut off of April 1878 and subsequent shoaling of the old channel leading from that to the
	11	New Orleans to Carrollton		12 [3]		New Orleans & Southern Packet Co., Carrollton Packet Co., Lake Pontchartrain Packet Co., Lake Pontchartrain Packet Co., Lake Pontchartrain

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Mississippi: Minn., Wis., Iowa, Ill., Mo., Ky., Tenn., Ark., Miss., La. (con.).	34.0	Bayou Sara to Red River Landing.	.....	(a)	(b)	Co., Natchez Transportation Co., Ouachita Transportation Co., Royal Route Co., River Sand and Gravel Co., Southwestern Lumber and Box Co., J. W. Thompson, Ward Lumber Co., Rock Island Steamboat Co., Whiteman Bros., Louisiana Petroleum Co., Parker Line, Mississippi Packet Co., Mississippi River Transportation Co., Baton Rouge and Atchafalaya River Packet Co., Christie & Lowe, Robert Cothell, Dixie Transportation Co., Joseph F. Fisher, Monroe Railway and Navigation Co., R. F. Learned, Lafourche Packet Co., Lambon & Noel Lumber Co.	front of the city practically destroyed the harbor which became unnavigable except at high stages of the river. The new outlet was opened in the spring of 1903. Uninterrupted navigation of Vicksburg Harbor has been maintained for 3 years, and the mouth of the Yazoo River has been opened to boats of 6 feet draft at mean low water.
	1.0	Red River Landing to Red River.	.....	(a)	(b)		
	64.0	Red River to Natchez, Miss.	.....	(a)	(b)		
	92.0	Natchez to Warrenton, La.	.....	(a)	(b)		
	7.0	Warrenton to Vicksburg.	.....	(a)	(b)		
	.....	Vicksburg to Memphis, Tenn.	399.0	(a)	(b)	Vicksburg to Memphis: Jno. Barrett & Son, Bluff City Towing Co., Clifton Coal and Coke Co., Cape Girardeau Transportation Co., C. Jutte & Co. (Peoples Coal Co.), Kimball-Lacy Lumber Co., Paepake-Leicht Lumber Co., Patton-Tully Transportation Co., Wolf River Towing Co., Arkansas River Packet Co., W. P. Hall Stave Co., Helena Box Co., Lee Line of Steamers, Monongahela River Consolidated Coal and Coke Co., Huntington	Memphis is one of the most important river towns below the mouth of the Ohio River. Lines operate north and south, and much cotton is received, not only over the Mississippi, but also over the White, St. Francis, and Arkansas rivers.
	5.0	Vicksburg to Yazoo River.	.....	(a)	(b)		
	116.0	Yazoo River to Greenville, Miss.	.....	(a)	(b)		
	77.0	Greenville to Arkansas River.	.....	(a)	(b)		
	8.0	Arkansas River to White River.	.....	(a)	(b)		
	87.0	White River to Helena, Ark.	.....	(a)	(b)		
	9.0	Helena to Sterling, Ark.	.....	(a)	(b)		
	67.0	Sterling, Ark., to Memphis, Tenn.	.....	(a)	(b)		

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Mississippi: Minn., Wis., Iowa, Ill., Mo., Ky., Tenn., Ark., Miss., La. (con.).	44.0	Big Hatchee River to Obion, Tenn.	.....	(a)	(b)	R. R. and Transportation Co., Cape Girardeau Transportation Co., Clifton Coal and Coke Co., C. Jutte & Co. (Peoples Coal Co.), Paducah Furniture and Manufacturing Co., Interstate Transportation Co., Lee Line of Steamers, Monongahela River Consolidated Coal and Coke Co., Huntington and St. Louis Towboat Co., Ayer-Lord Barge Co., West Kentucky Coal Co.	River packets, has a large local business served by local packets. The traffic of the lower Mississippi is greatly augmented by the output of the Ohio River at this point, the single item of coal affording employment to a large fleet of towing steamers and barges. The coal is distributed among the principal cities south of Cairo, including New Orleans.
	65.0	Obion, Tenn., to New Madrid, Mo.	.....	(a)	(b)		
	49.0	New Madrid, Mo., to Columbus, Ky.	.....	(a)	(b)		
	21.0	Columbus, Ky., to Cairo, Ill.	.....	(a)	(b)		
	.....	Cairo to St. Louis, Mo.	200.0	(a)	(b)	Cairo to St. Louis: Jno. Barrett & Son, Cape Girardeau Transportation Co., C. Jutte & Co. (Peoples Coal Co.), Southeastern Missouri Sand and Towing Co., Lee Line of Steamers, Monongahela River Consolidated Coal and Coke Co., Ayer-Lord Barge Co., St. Louis and Tennessee River Packet Co., Eagle Packet Co.	St. Louis is the largest and most important city on the Mississippi. It is located on the west bank, about 700 miles south of St. Paul and more than 1,200 miles north of New Orleans; 20 miles below the mouth of the Missouri, and 39 miles below the mouth of the Illinois. It is thus practically at the confluence of these three rivers. At St. Louis the river commerce divides, that of the north finding its market and terminating its venture there. The shippers for export find here the products wanted by other localities and their venture originates here. The geographical situation of the city makes it the center of the river commerce of the West. Steamers may start from its levees bound for the headwaters of the Missouri River; for St. Paul and the upper Mississippi; for all points on the Illinois River; for Pittsburg and intervening points on the Ohio River; for all points on the Tennessee River; for all points on the Cumberland
	35.0	Cairo, Ill., to Commerce, Mo.	.....	.....	(b)		
	100.0	Commerce, Mo., to Kaskaskia River.	.....	.....	(b)		
	65.0	Kaskaskia River to St. Louis, Mo.	.....	.....	(b)		

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Mississippi: Minn., Wis., Iowa, Ill., Mo., Ky., Tenn., Ark., Miss., La. (con.).							mainly dependent on the river as a means of transportation, or are compelled to haul long distances by wagon. The navigation interests most particularly benefited by the reservoir system, in addition to the above, are the steamboats operating on the Mississippi River from St. Paul down. Commerce for 1905 included 453,000,000 feet B. M. of logs, or 1,585,000 tons.
Red, La.		Mouth to Denison, Tex.	800.0		a 1905, 174,870 tons. a 1906, 163,264 tons.	Angola Transfer Co., Fisher & Co. Monroe Ry. and Navigation Co.	Notwithstanding the facilities for quick transportation afforded by railroads the commerce of the Red River consists of large shipments of cotton, cotton seed and its products, lumber, staves, timber, etc., with large return freights of general merchandise. Improvement has effected a reduction of freight rates on all commodities.
	162.0	Mouth to Montgomery, La.		3.0			
	158.0	Montgomery to Shreveport, La.		2.5			
	188.0	Shreveport, La., to Fulton, Ark.		2.0			
	292.0	Fulton, Ark., to Denison, Tex.					
Black, La.		Mouth to Trinity, La.	56.0		a 1905, 141,779 tons. a 1906, 233,912 tons. b 178,429 tons.	Parker Line, Carter Packet Co., Fisher & Co.	These two names apply to the same river. Statement made that during the period of navigation the rail rate on cotton from Monroe to New Orleans, La., is $1.25 per bale, but when navigation is suspended this rate is advanced to $1.75 per bale. Railroad rates from Monroe to inland towns, as a rule, are greatly in excess of those to points where there is rail competition. The territory above Monroe recently opened to railroad traffic, but railway lines have not met the water rate. This river is being improved by the construction of 9 locks and movable dams, which will afford a navigable depth of 6.5 feet from the mouth of the Black River to a point 10 miles above Camden, Ark. (300 miles.)
Ouachita, La.		Trinity to Arkadelphia, Ark.	380.0				
			436.0				
		Mouth to Harrisonburg, La.		3.5			
		Harrisonburg to Monroe, La.		1.25			
		Monroe, La., to Camden, Ark.		.67			

Bayou Bartholomew, La.		Mouth to Mer Rouge Point Bluff, La.	141.0		[illegible]		
Boeuf, La.		Mouth to Point Coupee, La.	[illegible]		[illegible]		
Tensas, La.[a]		Mouth to Westwood Place, La.	81.0		[illegible]		
Bayou Macon, La.[a]		Mouth to Lake Fitz, La.	[illegible]		[illegible]		
Bayou D'Arbonne and Corney, La.[a]		Mouth to Crow Landing, La.	57.0		[illegible]		
Little, La.[a]		Mouth to Lake Catahoula, La.	[illegible]		[illegible]		
Homochitto, Miss.		Mouth to Yazoo and Mississippi Valley R. R. bridge	100.0	3.0			Improvement of river has effected no change in freight rates.
Big Black, Miss.		Mouth to Baldwin Ferry, Miss.	70.0				Improvements discontinued on account of the small commerce and the improbability of an increase of business.
Yazoo, Miss.		Mouth to confluence of Yalobusha and Tallahatchie rivers	171.0	3.0		Mississippi, Yazoo, and Sunflower River Transportation Co.	The Yazoo is navigable for its entire length the year round. Statement made that freight rates on cotton are 50 per cent less than by rail; cotton seed 33⅓ per cent less; livestock shipments about ⅓ less; grain, meal, flour, and provisions 50 per cent less. To inland points railroad rates said to be largely in excess of boat rates for the same distances. Large quantities of timber are rafted which could not be reached by rail. Commerce for the past 10 years ranges between 102,000 and 344,000 tons annually, the average being 231,558.
Tallahatchie, Miss.		Mouth to Batesville, Miss.	180.0	3.0			Tallahatchie and Yalobusha units to form the Yazoo. Commerce included in that of Yazoo River.
Big Sunflower, Miss.	[illegible]	Mouth to Clarksdale, Miss. Mouth to Winstanton, Miss.	180.0	3.0		Mississippi, Yazoo, and Sunflower River Transportation Co.	Clarksdale is only reached at long intervals. Fairemia, about 100 miles above the mouth, is considered the head of navigation. Boats can pass through Tchula Lake at moderately high stages of water. Commerce included in that of Yazoo River.

[a] Flood year.
[b] Average, 17 years.
[c] All of these streams are tributary to the Ouachita River and are not navigable for steamboats at low water. Improvement has enabled larger boats to run and to make trips in less time than was required formerly, lengthened the period of navigation, and resulted in lower rates of freight.
[d] Maximum.
[e] Minimum.

TABLE 3.—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Coldwater, Miss.		Mouth to Yazoo Pass, Miss.	80.0				Commerce included in that of Yazoo River.
Arkansas, Ark.		Mouth to Fort Gibson, Ind. T.	463.0		1906, 103,214 tons	Arkansas River Packet Co.	It is reported that improvement has secured for shippers at Pine Bluff, Ark., a rate of about 50 per cent of the railroad rate on freights. A large part, or 64 per cent, of commerce was rafted logs.
	80.0	Mouth to Swan Lake, Ark.		2.0			
	174.0	Mouth to Little Rock, Ark.		2.0			
	209.0	Little Rock to Fort Gibson, Ind. T.		2.0			
White, Ark., Mo.		Mouth to Forsythe, Mo.	505.0		[a] 1904, 193,498 tons [a] 1905, 134,588 tons. [a] 1906, 100,083 tons.	Red River L. T. and Transportation Co. White River Transportation Co.	52 per cent of the tonnage reported for the fiscal year (1905-6) was rafted saw logs and railway ties floated with the current. It is reported that a transportation company has been organized at Devall Bluff for the purpose of operating a towboat line between that point and the Mississippi River. Another company is forming at Batesville, the purported object of which is to operate a packet line between Batesville and Jacksonport, making connection at that place with the Rock Island System of railways.
	264.0	Mouth to Jacksonport, Ark.		3.0			
		Jacksonport to Batesville, Ark.		1.33	[a] 1904, [b] 15,655 tons. [a] 1905, [b] 12,496 tons. [a] 1906, [b] 11,188 tons.		
Cache, Ark.		Mouth to Gray's Bridge, Ark.	95.0	(c)	[a] 1903, 16,843 tons [a] 1904, 15,865 tons. [a] 1905, 11,660 tons. [a] 1906, 10,942 tons.		75 per cent of the commerce for the year 1905 was rafted and floated with the current. The entire commerce was that of transporting saw logs and railway ties.
Black, Ark., Mo.		Mouth to Poplar Bluff, Mo.	239.0		[a] 1903, 138,181 tons [a] 1904, 191,285 tons. [a] 1905, 144,065 tons. [a] 1906, 139,384 tons.	Inman Packet Co.	Timbering and kindred industries produce the bulk of the steamboat commerce.
	116.0	Mouth to Current River.		3.0			
	123.0	Current River to Poplar Bluff.		1.5			
Current, Ark., Mo.		Mouth to Pitmans Landing, Mo.	41.0		[a] 1904, 55,573 tons [a] 1905, 74,048 tons. [a] 1906, 47,704 tons.		Boats can not reach Pitmans Landing in the low-water season. Timbering and kindred industries produce the bulk of the steamboat commerce.
	25.0	Mouth to Blunts Landing.		3.0			
	7.0	Blunts to Little Black River.		2.0			
	9.0	Little Black River to Pitmans Landing.		1.33			

St. Francis, Ark., Mo		Mouth to Wappapello, Mo	270.0		* 1903, 88,000 tons * 1904, 110,179 tons * 1905, 149,000 tons. * 1906, 137,310 tons.	Planters Packet Co	90 per cent of the commerce for 1906 was saw logs. The St. Francis River is one of the most important in this section. Commerce included in that of the St. Francis River.
L'Anguille, Ark		Mouth to Marianna, Ark.	94.0				
Obion, Tenn		Mouth to Obion, Tenn	60.0	3.0	1906, 30,000 tons		Commerce consists almost wholly of timber products. Navigability depends largely on the stage of water in the Mississippi River.
Forked Deer, Tenn North Fork. South Fork.		Mouth to Dyersburg, Tenn	90.0	2.0	1904, 60,000 tons 1906, 20,730 tons.		The Forked Deer River empties into the Obion 3½ miles above its mouth. The commerce on this river consists almost wholly of timber and its products.
Ohio, Ill., Ind., Ohio, Ky., W. Va., Pa		Cairo, Ill., to Pittsburg, Pa	[1017.0]		1904, 7,710,501 tons 1905, 7,003,478 tons. 1906, 9,014,435 tons. 1907, 11,205,630 tons. 1908, 8,780,027 tons. 1909, 13,690,720 tons. 1910, 14,004,399 tons. 1911 ‡ 1912, 12,202,017 tons. 1913, 12,400,849 tons. 1914, 10,142,661 tons. 1915, 13,163,606 tons.	Monongahela River Consolidated Coal and Coke Co., A. R. Budd Coal Co., West Kentucky Coal Co., C. Jutte & Co., People's Coal Co.	The Ohio is the most important commercial stream in the country. It is formed at Pittsburg by the junction of the Allegheny and Monongahela rivers. It receives on its course to the Mississippi a great number of important tributaries, which for the most part are navigable either naturally or as the result of various improvements. The Ohio flows through a region very prosperous by reason of its agricultural and industrial interests, which have given it a large population. At Pittsburg and on the upper part of its course it receives coal from the rich fields of Pennsylvania and West Virginia, which it takes to Cincinnati, Louisville, St. Louis, and other points as far south as New Orleans. Commerce consists principally of coal, iron, manufactured products, and general merchandise.

* Fiscal year. † Upper White. ‡ Eight to 10 inches.

‡ The Report of the Chief of Engineers for 1912, part 2, vol. 1, p. 2006, says: "The commerce of the river is well known to be an extensive one and of the greatest national importance. It varies in and out at different points and over different sections as indicated by the following official record for the past year. In Pittsburg Harbor 10,016,000 tons, of which 8,000,413 was coal; at Davis Island Dam 3,400,000 tons, of which 3,307,738 was coal; at Louisville, Ky., through the canal and over the falls 1,479,642 tons. Besides the above, 173 packet steamers in regular service on the river reported general merchandise freight carried to the amount of 10,004,978 tons. There is also a considerable amount of coal contributed on the lower river, of which no statistics are available in this Department."

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Ohio, Ill., Ind., Ohio, Ky., W. Va., Pa. (continued).	182.0	Cairo to Evansville, Ind.	.....	21.8–8.3	.....	.....	The distances given here in reference to the depths of the various sections of the river are taken from the Chief of Engineers Report for 1906, page 509, while the distances as shown below are taken from the U. S. Census Report of 1890, which will account for the slight difference in the figures.
	185.0	Evansville, Ind., to Louisville, Ky. (Foot of Falls).	.....	8.3–10			
	245.0	Louisville, Ky. (Head of Falls), to Portsmouth, Ohio.	.....	12.7–9.7			
	171.0	Portsmouth, Ohio, to Parkersburg, W. Va.	.....	9.7–6.4			
	180.0	Parkersburg, W. Va., to Davis Island Dam.	.....	6.4–4.2			
		1. Cairo, Ill., to Evansville, Ind.	184.0	.....	.....	Ryman Line, St. Louis and Tennessee River Packet Co., Evansville, Paducah and Cairo Packet Line, Barrett Line, Ohio and Tennessee River Transportation Co., Ayer Lord Barge Co.	(1) The commerce of this section is enlarged by that of the Tennessee and Cumberland Rivers.
	47.0	Cairo, Ill., to Paducah, Ky.					
	2.0	Paducah, Ky., to Tennessee River.					
	10.0	Tennessee River to Cumberland River.					
	70.0	Cumberland River to Wabash River.					
	55.0	Wabash River to Evansville, Ind.					
		2. Evansville, Ind., to Louisville, Ky.	187.0	.....	.....	Louisville and Evansville Packet Co., Evansville and Bowling Green Packet Co.	(2) At Louisville the improvements have included the enlargement of the Louisville and Portland Canal and the straightening and deepening of the water flow of Indiana Chute. The Indiana Chute is the main channel of the river by which commerce passes over the falls. For statistics regarding Louisville and Portland Canal, see special table of Government canals.
	8.0	Evansville to Green River, Ky..					
	179.0	Green River to Louisville, Ky. (Louisville & Portland Canal.)					
	.....	(3) Louisville, Ky., to Cincinnati, Ohio.	129.0	.....	.....	Lee Line steamers, Louisville and Cincinnati Packet Co.	(3) At Cincinnati, several railroads, including the Louisville and Nashville, and Queen and Crescent, compete with the river for southern traffic.
	55.0	Louisville to Carrollton, Ky.					
	74.0	Carrollton, Ky., to Cincinnati, Ohio.					

		(4) Cincinnati, Ohio, to Davis Island Dam	[illegible]			Cincinnati, Portsmouth, Big Sandy and Pomeroy Packet Co., Ohio and Great Kanawha Packet Co., "Bay Line," Cincinnati, Pomeroy and Charleston Packet Co., Ohio and West Virginia Transportation Co., Pittsburg and Cincinnati Packet Line, Pittsburg, Wheeling and Parkersburg Packet Co., Muskingum and Ohio River Transportation Co., Campbell's Creek Coal Co., Pulled Coal Co., Marmet Coal Co., Collins and Hartwig Co., E. I. Hicker Transportation Co.	(4) Davis Island Dam is a movable dam and the first of a series for the improvement of the upper portion of the river. It has proved a great benefit to commerce in general, and especially to the coal interests, by allowing the harborage of coal at Pittsburg in large quantities while awaiting stages of water suitable to the passage of boats down the river. In 1903 traffic through Dams 1 and 2, 3,053,539 tons. See special table of slack-watered rivers.
	114.0	Cincinnati to Portsmouth, Ohio						
	90.0	Portsmouth to Boaston, Ohio						
	10.0	Boaston, Ohio, to Catlettsburg, Ky						
	51.0	Catlettsburg to Point Pleasant, W. Va						
	90.0	Point Pleasant to Parkersburg, W. Va						
	13.0	Parkersburg to Marietta, Ohio						
	51.0	Marietta, Ohio, to Wheeling, W. Va						
	55.0	Wheeling to Steubenville, Ohio						
	43.0	Steubenville to Beaver, Pa						
	30.0	Beaver to Davis Island Dam						
		(5) Davis Island Dam to Pittsburg	3.0					(5) Davis Island Dam, forming as it does the Pool of Pittsburg Harbor, has lent its great part to the general effect on freight rates to and from Pittsburg. More coal is said to be shipped to and through Pittsburg than is handled in any other city in the country, but there does not appear to be any local bureau devoted to the comprehensive collection of statistics regarding the city's transportation and manufacturing interests. Details of the movement of coal in Pittsburg District over the several transportation routes are collected in the reports of the Geological Survey.
Tennessee, Ky., Tenn., Ala.		Mouth to Knoxville, Tenn.	655.0		[illegible] tons [illegible] tons	St. Louis and Tennessee River Packet Co., American Oak Tanning Co., Knox, Sevier and Jefferson Boat Co., Tennessee and French Broad Navigation Co., Tennessee Navigation Co., Tennessee, Ohio and Duck River Transportation Co., Ohio and Tennessee River Transportation Co., Chattanooga Line Steamers, Ayer & Lord Barge Co.		The Tennessee River is formed by the confluence of the French Broad and Holston rivers 4.5 miles above Knoxville, Tenn., and is one of the best natural means of communication in the Mississippi Valley. It flows south into Alabama, then westwardly toward the Mississippi River until deflected, it turns north and again crosses the State of Tennessee, emptying into the Ohio at Paducah, Ky. The Tennessee with its tributaries forms a system of internal waterways, navigable by steamboats for more than 1,200 miles. Its tributaries are still further navigable by rafts and flat boats for a distance of more than 1,000 miles, thus constituting a system of navigable waterways about
	180.0	Knoxville to Chattanooga, Tenn.		1.5	[illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons [illegible] tons			
	230.0	Chattanooga to Riverton, Ala.		9.0	[illegible] tons. [illegible] tons. [illegible] tons. [illegible] tons [illegible] tons. [illegible] tons			

* Not total traffic of the Tennessee River below Knoxville, excluding duplications in the traffic by methods given below.
† Between Chattanooga, Tenn., and Florence, Ala.
‡ Above Chattanooga, Tenn.

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Tennessee, Ky., Tenn., Ala. (continued).					1902,[a] 137,861 tons. 1903,[a] 297,851 tons. 1904,[a] 173,406 tons. 1905,[a] 175,800 tons.		2,350 miles in length. The river is navigable the year round from the mouth to Riverton, Ala. Just above Riverton a lateral canal about 8 miles long is now under construction by the Government. The canal extends past the Colbert and Bee Tree Shoals. Another canal 3 miles long is projected at Little Muscle Shoals, just above Florence, Ala., and the Muscle Shoals Canal now surmounts the Big Muscle Shoals and Elk River Shoals. Local boat lines have headquarters at the principal towns along the river. There appears to be no through traffic covering the entire length of the river, the longest regular boat service being between Chattanooga, Tenn., and Paducah, Ky. The value of the river traffic for 1904 was estimated by the Chief of Engineer's Report at about $30,000,000.
	226.0	Riverton, Ala., to mouth.		3.0	1896,[b] 864,061 tons. 1897,[b] 390 167 tons. 1898,[b] 602,916 tons. 1899,[b] 462,307 tons. 1900,[b] 1,327,009 tons. 1901,[b] 658,102 tons. 1902,[b] 1,056,270 tons. 1903,[b] 848,758 tons. 1904,[b] 871,380 tons. 1905,[b] 663,606 tons.		
French Broad, Tenn		Mouth to Leadvale, Tenn	70.0	1.5	1904, 258,847 tons 1905, 188,700 tons.	Tennessee and French Broad Navigation Co.	The French Broad is one of the largest tributaries of the Tennessee; rising in North Carolina, it flows generally in a northwesterly direction and finally unites with the Holston River in the State of Tennessee about 4.5 miles above Knoxville to form the Tennessee River.
Little Pigeon, Tenn		Mouth to Catlettsburg, Tenn.	2.0	1.5			The Little Pigeon River practically amounts to an additional landing of the French Broad. Traffic movement included in French Broad.
Clinch, Tenn		Mouth to Clinton, Tenn	60.0	2.0	1904, 100,701 tons. 1905 126,800 tons.		Small steamboats ply as far as Clinton. Statement made that 35 per cent of tonnage transported only from Kingston, Tenn., to mouth, a distance of 1 mile. Balance mostly rafted. General merchandise, forest products, and farm products.

Hiwassee, Tenn		Mouth to Savannah Point, Tenn	41.0	4.0	1914, 4,[illegible] tons 1915, 10,[illegible] tons.		The Hiwassee rises in the mountains of North Carolina and northern Georgia, flows in a northwesterly direction, and enters the Tennessee about 35 miles above Chattanooga, draining an area of about 2,[illegible] square miles. There is no regular upstream movement on the river. Occasionally a small steamboat runs up 30 to 60 miles from the mouth during periods of high water. Commerce is principally logs rafted.
Holston, Tenn		Mouth to Bailey's Shoal	137.0		1914, 13,[illegible] tons 1915, 11,[illegible] tons.		
Cumberland, Ky., Tenn	187.0 43.0	Mouth to Burnside, Ky Mouth to Nashville, Tenn Nashville to Burnside, Ky	318.0		1914, 31[illegible] tons 1915, [illegible] tons	Cumberland and Tennessee Transportation Co., Hyman Tipe, Cyrus & Lord Barge Co	The Cumberland River rises in eastern Kentucky, flows in a tortuous course about 688 miles through eastern Kentucky, middle Tennessee, and western Kentucky, falling into the Ohio River near Smithland, Ky. Below Nashville the river is usually navigable for all steamboats plying on it for 6 months in each year; for boats not drawing over 3 feet, from 6 to 8 months; and for boats drawing 18 inches or less, the whole year. Navigation is practically closed for several months each year during low water. The section of the River from Nashville to Rock Castle River, 357 miles above Nashville, in its original condition, was much obstructed by rocks, snags, etc., which greatly impeded navigation between Nashville and Burnside, since the canalization of the river the navigation has been much improved. Statement made that Tennessee Central R. R., which parallels the Cumberland from Nashville to Clarksville, Tenn., has reduced rates since completion of present improvements. The river and harbor act of Mar. 3, 1905, authorized the Cumberland River Improvement Co. of Kentucky to improve the Cumberland River and tributaries, including the South Fork, above Burnside, Ky., at its own expense, by construction of necessary locks and dams under Government

* Between Chattanooga, Tenn., and Florence, Ala.

* Between Florence, Ala., and Paducah, Ky.

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Cumberland, Ky., Tenn. (continued).							supervision, and to use the resulting water power, with the provisions that such use shall not impede navigation, that the locks and dams shall be at least equal in size and capacity to other locks and dams constructed on the Cumberland River, and that the company may collect toll for their use for 40 years after their completion at rates to be fixed by the Secretary of War. Commerce: Farm and forest products, sand, gravel, and general merchandise.
Wabash, Ill., Ind.		Mouth to Vincennes, Ind.	126.7		1905, [a] 8,025 tons 1906, [a] 3,990.5 tons.		The Wabash at one time was of considerable importance to the commerce of northern and western Indiana. Lafayette was practically the head of navigation, and prior to the construction of the Wabash and Erie Canal it depended much upon the river for an outlet. But with the opening of the Wabash and Erie Canal, the trade of the valley was diverted eastward and the importance of the river waned. A lock and dam was built at Grand Rapids by the Wabash Navigation Co., which was purchased by the Government, and improvements have been made both above and below Vincennes, Ind. (Traffic passed through lock at Grand Rapids.)
		Mouth to Mount Carmel, Ill.					
	34.0	Mount Carmel to Vincennes, Ind.		1.67			
Tradewater, Ky.		Mouth to point on river	41.0	2.5			It has been impossible to obtain any commercial statistics, but considerable coal and timber is, however, brought out of the stream. Improvement has been discontinued for several years.

White, Ind	11.0 27.0	Mouth to Petersburg, Ind Mouth to point 10 miles above Petersburg, Ind	40.0 [illegible]	3.0 1.5				In the opinion of the Government engineers, the further improvement of the White River should be postponed until the improvement of the Wabash River has been such as to afford an outlet for any traffic which may then be developed on the White.
Green and Barren, Ky		Mouth of Green River to Rochester (Green and Barren), and Mammoth Cave From mouth of Barren to Mammoth Cave, Ky	180.0 47.0 227.0	3.0	1900, 3,[illegible] tons 1901, [illegible] tons	Evansville and Rochester Green Packet Co.		The original scheme of slackwater navigation on these rivers included 4 locks in Green and 1 in Barren River. In 1900 it was turned to the Green and Barren River Navigation Co. for a term of 30 years. The Government purchased their rights and assumed control of the river in 1906. Since then it has repaired the locks and built 9 more, thus putting the river in good navigable condition.
Rough, Ky		Mouth to Hartford, Ky	34.5	4.0	1904, [illegible] tons 1905, [illegible] tons 1906, [illegible] tons			
Kentucky, Ky		Mouth to Irvine, Ky	200.0	3.5	1904, [illegible] tons 1905, [illegible] tons 1906, [illegible] tons	R. T. Preston & Son		The principal commerce on the river is timber, much of it loose logs, and the improvement is rather detrimental to this than otherwise. The development of coal lands with the resulting traffic is the specific end of improvement. Appears to have no material effect on freight rates.
Big Sandy, Ky., W. Va Pug Fork Levisa Fork		Mouth to Louisa, Ky Louisa to Williamson, W. Va Louisa to Piketville, Ky	97.0 50.0 [illegible]	6.0	1904, [illegible] tons 1905, [illegible] tons 1906, [illegible] tons			Levisa and Pug forks unite at Louisa, Ky., and form the Big Sandy River. They are being improved by the construction of two locks and dams, one in each fork.
Muskingum, Ohio		Mouth to Dresden, Ohio	91.0	3.0	1904, [illegible] tons 1905, [illegible] tons	Muskingum and Ohio River Transportation Co.		Zanesville is the head of slackwater navigation. Light-draft boats can reach Dresden at ordinary stages. Extensive improvements have been made by the Government. (See special table of Government slackwatered rivers.)
Great Kanawha, W. Va		Mouth to Longtrench Shoals	90.0	6.0	1904, 1,[illegible] tons 1905, 1,[illegible] tons.	Ohio and Great Kanawha River Packet Co., Campbell's Creek Coal Co., Marmet Coal Co., Collins & Hartwig Co., E. J. Hickey Transportation Co., Cincinnati, Pomeroy and Charleston Packet Co.		This river is especially important because of its coal tonnage. It is difficult to give the exact effect improvement has had on freight rates. There is, however, no doubt that the freight rates, where transportation by water is available, are regulated thereby. The rates for transporta-

* Fiscal year.

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Great Kanawha, W. Va. (continued).							tion by water have not changed materially, although the cost of floating plant has greatly increased. (Commerce chiefly coal and forest products.)
Little Kanawha, W. Va.		Mouth to Burnsville, W. Va.	120.0		1904, 66,415 tons		Only flatboat navigation to Burnsville. The holdings of the Little Kanawha Navigation Co., consisting of 4 locks and dams, were purchased by the Government in 1905, and resulted in a lowering of freight rates on the river in an amount equal to the toll charged by the Navigation Co.
	48.0	Mouth to Creston		4.0	1905, 106,510 tons.		
	72.0	Creston to Burnsville		.5			
Monongahela, Pa., W. Va.		Mouth to Fairmont, W. Va.	131.0	7.0	1902, 9,100,887 tons 1903, 11,369,814 tons. 1904, 9,268,736 tons. 1905, 9,211,752 tons. 1906, 11,447,444 tons.	Monongahela & Ohio Packet Co., Monongahela River Consolidated C. & C. Co., Vesta Coal Co., Diamond Coal and Coke Co., A. R. Budd Coal Co., Clyde Coal Co., C. Jutte & Co. United Coal Co., Blaine Coal Co., Shoenberger Coal Co., Dilworth Coal Co., Sharpsburg Sand Co., Rodgers Sand Co., Iron City Sand Co.	Important river for the transportation of coal. Extensive improvements have been made and maintained by the Government. The effect on freight rates of the slackwater system on the Monongahela is very great, particularly so for coal. For a haul of 50 miles the rate is 15 cents per ton less than by rail, and as the haul increases the advantage of the river advances rapidly.
Allegheny, Pa., N. Y.		Mouth to Olean, N. Y.	255.0	1.4	1904, 2,555,547 tons	Diamond Coal and Coke Co., Dilworth Coal Co., Iron City Sand Co., Sharpsburg Sand Co.	Except on the lower 25 miles of the river, the principal traffic on the Allegheny consists of the downstream transportation of timber and lumber rafts, new coal-boat bottoms, barges and rafts usually loaded with lumber and its products, and the towage of gravel, sand, stone, etc. Steamboating is not now conducted to any extent above Kittanning, principally because of obstructive low bridges along that section.
	4.0	Harbor at Pittsburg		8.0	1905, 2,864,445 tons.		

Missouri, Mo., Rome Point, Iowa, to the A Tak, Mont.		Mouth to Fort Benton, Mont.	[illegible]		[illegible]		The Missouri in the matter of improvements was placed under the Missouri River Commission in 1884. This Commission was abolished by the river and harbor act of 1902. The Missouri is the second longest navigable stream in the United States, but its commerce is of slight importance and appears to be on the decrease. Considerable navigation was witnessed after the discovery of gold mines in Montana, which started immigration in that direction. During the first years of the civil war the government established a number of posts on the Missouri which increased the demand for boats. Various lines carried private, military, and Indian freight and were quite successful. In 1868 the first railroad reached Sioux City. This caused a gradual decline in river traffic. The river has been navigated by steamers since 1819. The Government improvements have kept the river fairly clear of snags until the great flood of 1903 on the lower river, which brought many new snags to light.
		Great Falls, Mont., to Milk River	[illegible]	[illegible]	[illegible]		
			[illegible]				
	140	Sioux City to Fort Benton		[illegible]			
Hannibal, Mo.		Mouth to Lillington, Mo.	[illegible]	[illegible]	[illegible]		
Osage River, Mo.		Mouth to Warsaw, Mo.	[illegible]	[illegible]	[illegible]	Anchor Milling Co.	On Feb. 14, 1908, a break was made in the nearly completed dam and lock. Navigation have been taken in reliable
Yellowstone, Mont.		Mouth to Glendive	[illegible]			Benton Packet Co.	
Illinois, Ill.		Mouth to La Salle, Ill.	[illegible]	[illegible]	[illegible]	Lasalle and Peoria Packet Co., Eagle Packet Co.	The State of Illinois improved that part of the river between Lasalle and Copperas Creek by the construction of two locks and dams. The U. S. Government continued the improvement to the Mississippi. The Illinois River forms part of a waterway from Lake Michigan to the Mississippi. Maintaining navigation on this river is important, as it helps regulate freight rates in this section.
	[illegible]	Mouth to Copperas Creek					
	[illegible]	Copperas Creek to Lasalle					

* Average minimum through two locks.

TABLE 3—*Mississippi River and tributaries*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
St. Croix, Wis., Minn.		Mouth to Taylors Falls, Wis.	52.0	3.0	1904, 600,000 tons. 1905, 350,000 tons.		A few steamboats make occasional trips from Stillwater to Taylors Falls during the season, and one is now running regularly between Taylors Falls and Osceola. Steamboat operations have been greatly interfered with heretofore by running of loose logs in immense numbers and by cutting off the natural low-water flow of the river at dams controlled by the lumbermen. Logging operations are, however, rapidly declining on this stream. Commerce principally consisted of loose-log traffic.
Minnesota, Minn.		Mouth to Le Sueur	88.0	2.0			No commerce now exists on this stream except that of small pleasure launches and occasional excursion steamers, the river not having been maintained in such condition as to make other commerce possible.

TABLE 4—*River flowing into Canada*

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Red River of the North, Minn., N. Dak.		Belmont, N. Dak. to Canadian border.	180.0	2.0	1903, 28,353 tons. 1904, 19,295 tons. 1905, 22,353 tons.		Navigation on the Red River of the North is at present confined to comparatively short stretches north and south of Grand Forks. It consists mainly in the transportation of wheat to Grand Forks by two steamboats and twelve barges.

TABLE 5.—Rivers tributary to Pacific Ocean

Name of stream and locality	Distance between points in tributary	Points connected	Navigable length	Depth at low water	Traffic movement	Transportation companies	Remarks
	Miles		Miles	Feet			
Redwood Creek, Cal		Mouth to Redwood, Cal	1.0	1.0	1913, 91,000 tons 1914, 10,000 tons 1915, 47,077 tons	Piper-Aden-Goodall Co	Commerce consists of lumber, supplies and products, codfish and salt
San Joaquin, Cal		Mouth to Stockton, Cal Stockton to Railroad crossing Stockton to Lodeburgh, Cal	50.0	8.0 3.0 [illegible]	1914, 300,000 tons 1915, 373,000 tons	Santa Fe Terminal Co. of California, California Navigation and Improvement Co., California Transportation Co., Piper-Aden-Goodall Co., Central Pacific Railroad Co., Southern Pacific Railroad Co.	Commerce between Stockton and San Francisco is important, and consists of grain, mill stuff, merchandise, and lumber. Above Stockton the commerce is unimportant
Mokelumne, Cal	13.0	Mouth to Cliff New Hope Bridge Mouth to Snodgrass Slough	30.0	9.0 6.0		California Navigation and Improvement Co., California Transportation Co., Piper-Aden-Goodall Co., Central Pacific Railroad Co	The maintenance of navigation on this river is important, as the annual tonnage varies between 40,000 and 80,000 tons and the freight rates on the river are about one-half the railroad rates. Commerce: Merchandise, grain, fruits, vegetables, and dairy products.
Sacramento, Cal	64.0 108.0	Mouth to Red Bluff, Cal Mouth to Sacramento Sacramento to Red Bluff	302.0	7.0 9.0	1914, 300,000 tons 1915, 355,037 tons	California Transportation Co., Piper-Aden-Goodall Co., Central Pacific Railroad Co., Farmers' Transportation Co., Southern Pacific Railroad Co	Act of Congress approved March 1, 1893, created the California Debris Commission consisting of 3 officers of the Corps of Engineers. The duties of the Commission are the regulation of hydraulic mining in the territory drained by the Sacramento and San Joaquin River systems and to adopt plans to improve and protect the navigation of the rivers in the systems named. The commerce of the Sacramento River is variable and depends principally on the crops. In the early days of California, before the advent of railroads, fast river steamers ran regularly to Sacramento and freight rates were greatly in excess of present rates.

a Low water.

TABLE 5—*Rivers tributary to Pacific Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Feather, Cal.		Mouth to Marysville, Cal.	30.0	1.0-2.0	1904, 1,665 tons. 1905, 5,306 tons.		The Feather River freight is rapidly decreasing. The Débris Commission recently made an examination of the river and concluded that its limited navigation was due more to a lack of commerce and low freight rates than to any serious difficulties in the way of navigation.
Petaluma Creek, Cal.		Mouth to Petaluma, Cal.	16.0	4.0	1904, 44,000 tons. a 1905, 346,622 tons.	Piper-Aden-Goodall Co., Petaluma & Santa Rosa Ry. Co.	Commerce of Petaluma Creek is important and is increasing in volume. Freight rates are reasonable, due to the maintenance of the improvement, and also to railroad and steamboat competition. The building of electric railways out of Petaluma, which run in connection with boats plying from San Francisco to Petaluma, has increased the tonnage carried and the importance of this waterway.
Napa, Cal.		Mouth to Napa, Cal.	16.0	4.0	1905, 58,361 tons.	Monticello Steamship Co., Piper-Aden-Goodall Co.	Navigation is possible and profitable only at medium and high stages of the tide. Commerce consists of grain, wine, fruits, fresh and dried, dairy products, and general merchandise. Traffic reported is that carried by steamers; no statistics could be obtained of that carried by the schooners.
Coquille, Oreg.		Mouth to Myrtle Point, Oreg.	37.0		1904, 60,944 tons. 1905, 45,455 tons.		This stream empties into the Pacific Ocean near Brandon, Oreg., about 375 miles north of San Francisco. The river and ocean form the only practicable means of transporting commerce. The principal articles of commerce are lumber products, coal, live stock, and farm produce.
Coos, Oreg.		Mouth to forks	5.5		1903, 28,109 tons.		Coos River flows through a narrow but productive valley and is the only means of transportation. The commerce is carried on small steamers to Marshfield, where it is loaded into ocean steamers and taken to San Francisco markets.
North Fork		Mouth to point on river	8.5	1.5	1904, 49,987 tons.		
South Fork		do	8.5	1.5	1905, 44,308 tons.		

Siuslaw, Oreg		Mouth to Florence Florence to point on river	8 0 18 0	7 0 (1)	1914, 24,810 tons 1913, 13,100 tons	F. W. Cater & Co	As there is no railroad in this vicinity, the river and ocean form the only means of transportation. Traffic principally lumber.
			21 0				
Yaquina, Oreg		Mouth to point on river	23 0	14 18	1914, 1,113 tons 1913, 873 tons	Railway Transportation Co	The commerce on this river is unimportant, as this part of the country is thinly settled.
Nehalem (Nehalem Slough), Oreg		Mouth to Tillamook, Oreg	9 0	10 0	1914, 13,893 tons 1913, 13,910 tons	Pacific Navigation Co	The commerce consists chiefly of lumber and dairy products, exported to Portland and San Francisco, and general merchandise brought in by coasting vessels. Traffic includes that of Tillamook Bay.
Columbia, Wash, Oreg, Idaho		Mouth to Snake River	180 0			Oregon Railroad and Navigation Co., Columbia and Okanogan Steamboat Co., San Francisco and Portland Steamship Co., R. H. Thelen, Vancouver Transportation Co., Lewis River Transportation Co., San Francisco and Columbia Steamship Line, Spokane Line, Shaver Transportation Co., Long Lumber Co., California and Oregon Coast S. S. Co., Simpson Lumber Co., Cascade, Yosemite, Yellowstone, and Shoshone steamboat companies (separate corporations), Bee Steamship Co., Wasp Steamship Co., Bird, Bath & Co., Railway Transportation Co., Dalles, Portland and Astoria Navigation Co., Upper River Transportation Co., Washington Marine Co	The Columbia is the largest stream of the United States entering into the Pacific Ocean. It rises in British Columbia and flows southerly and westerly, and forms the boundary between the States of Oregon and Washington in the lower 130 miles of its course. There has been no general or continuous project for the improvement of the Columbia as a whole, all projects and improvements being confined to certain specified localities or parts.
Upper	124 0	Mouth of Snake to Celilo		3 5	1913, 37,934 tons 1913, 44,370 tons. 1914, 48,547 tons. 1913, 58,380 tons.		(1) In its original condition this portion of the river was much broken by many rapids, rendering navigation difficult and dangerous over certain stretches. These rapids are, with few exceptions, caused by ledge rock or broken ledges and rubble-gravel shoals, and isolated bowlders.

* Year ending Mar 1

† Light draft

TABLE 5.—*Rivers tributary to Pacific Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected.	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Columbia, Wash., Oreg., Idaho (cont'd).							
1. Upper (cont'd).							The channel before improvements was crooked, narrow, and shoal, the ruling depth between Celilo and Lewiston having been 2 to 3 feet at low water, with some of the rapids practically impassable.
2. Middle	109.0	Celilo to Vancouver, Wash. Dalles Rapids. Cascades.		8.0	[a] 1903, 36,181 tons. [a] 1904, 31,967 tons. [a] 1905, 35,166 tons. [a] 1906, 46,884 tons.		(2) The middle section contains serious obstructions to navigation in the Cascades, Dalles Rapids, and Celilo Falls. A canal 3.5 miles long, with a depth in channel of 6.5 feet at low water, has been constructed around the Cascades, and a canal 8.5 miles long with a width of 65 feet at the bottom and 8 feet deep is being built around Celilo Falls and Dalles Rapids to Three Mile Rapids and the channel through these is being widened and deepened. When improvements are completed it will give continuous navigation from the mouth of the Columbia to the mouth of the Snake River.
3. Lower	103.0	Vancouver to mouth		20.0	1902, 1,567,336 tons. 1903, 1,596,220 tons. 1904, 1,905,451 tons. 1905, 2,313,153 tons.		(3) The lower portion of the river is navigable for steamships drawing 23 feet of water, and the greater portion of its commerce is maritime. Portland is the principal port, being situated on the Willamette 12 miles above its junction with the Columbia and 110 miles from the sea. In this portion of the river it has excessive widths and abounds in numerous sand bars and shoals, over and between which a navigable channel, more or less tortuous and frequently narrow, carried a depth of 10 to 15 feet at low water in the unimproved state of the river. In addition to traffic movement given, Vancouver ships about 10,000,000 feet B. M. of lumber annually.

Clatskanie River		Mouth to Clatskanie	[illegible]	[illegible]	1903, [illegible] tons	Clatskanie Transportation Co.	The Astoria and Columbia River R. R. crosses the valley near the town of Clatskanie, but the river does the bulk of the business because it is the cheaper route of transportation.
Cowlitz, Wash.		Mouth to 10 miles above Toledo	[illegible]		1904, [illegible] tons 1905, [illegible] tons	Cowlitz Transportation Co.	The Cowlitz River rises in the Cascade Range and flows into the Columbia 34 miles from its mouth. The valley is exceedingly fertile and farmers ship great quantities of produce to market by boat.
Lewis East Fork North Fork		Mouth to Forks Mouth to La Center Mouth to Woodland	[illegible] [illegible] [illegible]	[illegible] [illegible] [illegible]	1904, [illegible] tons 1905, [illegible] tons	Lewis River Transportation Co.	The river is the only means of transporting the products of the valley to the Portland market. The commerce consists principally of lumber and farm products and general supplies.
Willamette River	13 ft 110 ft	Mouth to Harrisburg Mouth to Portland Portland to Corvallis	104 ft	33 ft 3 ft	1905, [illegible] tons 1905, [illegible] tons 1904, [illegible] tons 1905, [illegible] tons	Oregon City Transportation Co., Oregon R. R. and Navigation Co., Dallas, Portland and Astoria Navigation Co., Great Northern Steamship Co., San Francisco and Portland Steamship Co., R. H. Tietjen, Vancouver Transportation Co., Lewis River Transportation Co., Spencer Line, Shaver Transportation Co., Leon Lumber Co., California and Oregon Coast S. S. Co., Hind Rolph & Co., J. Kellogg Transportation Co.	The Willamette River rises in the Cascade Mountains about 150 miles southward of the Columbia and flows northerly generally parallel to and about 20 miles east of the coast line. It enters the Columbia about 102 miles above its mouth and 12 miles north of the city of Portland. The river drains an exceedingly fertile valley. The improvements by the Government are said to afford water transportation for most of the commodities raised in the valley, and have been instrumental in reducing freight on railroad shipments from valley points. Lines of the Southern Pacific parallel the river on each side.
Yamhill River		Mouth to McMinnville Dam	18 ft	4 ft	1903, [illegible] tons		The practical suspension of steamboat traffic since 1902 is owing to the fact that the Oregon City Transportation Co. has taken its boats for use on the Willamette River and has abandoned the McMinnville route because it declared the uncertainty of lock operation during the winter makes it impossible to compete with railroad rates. See special table of Government slack-watered rivers. In addition to tonnage given, 1,500,000 feet B. M. of logs passed over the dam during high water.

* Final year.

TABLE 5—*Rivers tributary to Pacific Ocean*—Continued

Name of stream and locality.	Distance between points indicated.	Points connected	Navigable length.	Depth at low water.	Traffic movement.	Transportation companies.	Remarks.
	Miles.		*Miles.*	*Feet.*			
Okanogan, Wash.		Mouth to Riverside, Wash.	40.0	2.0	1903, 6,317 tons. 1904, 1,636 tons.[a] 1905, 1,184 tons.	Columbia and Okanogan Steamboat Co.	The commerce of the river is carried on in small river steamers and consists of general traffic.
Pend Oreille, Wash.		Newport to Box Canyon, Wash.	54.0	4.0	1902, 15,868 tons. 1903, 27,100 tons. 1904, 39,974 tons.[a] 1905, 54,733 tons.		The commerce consists of towing logs and general traffic carried on by a number of small vessels. Heavy freight is carried mainly on barges in tow.
Snake, Wash., Idaho		Mouth to Asotin, Wash.	146.0	3.5	([b])	Oregon R. R. and Navigation Co.	The Government has made improvements on the river. The Dalles-Celilo portage road was recently completed by the State of Oregon and was ready for occupancy June 3, 1905; and is expected to bring the river below Riparia into competition with rail transportation.
Willapa, Wash.		Mouth to Willapa, Wash.	10.0	9.0	1904, 73,808 tons. 1905, 76,713 tons.[a]	Willapa Transportation Co., Beadle Bros.	Principal business is the rafting and floating of logs.
Chehalis, Wash.		Mouth to Elma, Wash.	31.0		1903, 4,972 tons.	Willapa Transportation Co., Slade Shipping Co., E. K. Wood Lumber Co., Pollard Steamship Co.	The commerce benefited by improvements consists very largely of floating and towing logs and the carrying of lumber in sailing vessels and steam schooners.
	15.0	Mouth to Montesano		4.0	1904, 5,673 tons.		
	16.0	Montesano to Elma		([c])	1905, 17,195 tons.[a]		
Nooksak, Wash.							Important tributaries of Puget Sound. The water traffic on Puget Sound and its tributary waters is very large and rapidly growing. It includes vessels of about every type and size in use throughout the world. The freight tonnage statistics do not include the local movement of saw logs and piling, which aggregated more than 500 million feet B. M., or more than 1,000,000 tons.
Stilaguamish, Wash.		Mouth to Florence, Wash.	6.0		1905, 7,153 tons.		
Skagit, Wash.		Mouth to Sedro-Woolley	25.0		1905, 23,499 tons.		
Snohomish, Wash.		Mouth to forks	22.0		1905, 32,530 tons.		
Skykomish, Wash. Snoqualmie, Wash.							
Duwamish, Wash.		Mouth to forks	12.0		1905, 23,260 tons.		
Puyallup, Wash.			.7	28.0			

Bellingham, Wash					
Blaine, Wash					
Whatcom Creek, Wash	Mouth to railroad bridge	13 11	3 11		
		8	13 11		
Colorado, Ariz.	Mexican border to Yuma			Colorado Steam Navigation Co.	Commerce is of a general nature, consisting largely of lumber, shingles, and fish. The first traffic on the Colorado was in 1851 for the specific purpose of transporting supplies to the Government post at Yuma, Ariz. Civilian freight on the river first began in 1859 and steadily increased until the Southern Pacific Railroad reached Yuma. The only company operating on the river at present is the Colorado Steam Navigation Co. They operate one steamer, the Cochan, and the barge Silas J. Lewis.

a Reports and imports

b See Upper Columbia

c Light draft

2. COMMERCE ON INTERIOR RIVERS

FLOATING EQUIPMENT

TYPES OF VESSELS EMPLOYED

Vessels employed on western rivers may be divided into two general classes: (*a*) Those provided with their own propelling machinery, such as packet boats engaged in transporting passengers and general merchandise, towboats used for towing or pushing barges, and gasoline boats used for the transportation of passengers and light freight. Packets are constructed with either side-wheels or stern-wheels. Towboats are principally of the stern-wheel type, and gasoline boats are either stern-wheel or screw propelled. (*b*) All carriers that have to be towed or moved by external means, such as coal barges or decked merchandise barges. In addition to these a large number and variety of craft are used in maintaining traffic and the proper condition of the waterways, such as snag boats, derrick boats, repair and pump boats, and quarter boats employed as storage or supply boats and as house boats for employees.

These two general classes of boats are the result of long experience, and the types adopted appear to be peculiarly fitted for the service under existing circumstances.

The requirements for a river steamboat are said to be such speed as has been found economical for the service engaged in, the least possible load draft, and such freight and passenger capacity as the usual run of business warrants. In the case of the towboat large reserve propelling power is an important item. In the coal trade river men divide cargo vessels engaged in this business into two classes, known, respectively, as (*a*) coal barges, size 135 by 26 by 8½, cost $1,600, carrying 550 short tons of coal, employed mainly in the trade to Cincinnati, Louisville, and other Ohio river points; (*b*) coal boats, size 175 by 26 by 10, cost $850, carrying from 1,000 to 1,200 tons of coal, employed chiefly in the "long-river" trade to New Orleans, where they are sold for firewood, shacks, etc.

The so-called model barges are decked over and are employed chiefly to carry steel, nails, wire, etc., down and to bring back molasses, sugar, and lumber. Size 225 by 36 by 10, cost $6,000 to $20,000.

Steel barges on the Ohio.—The use of steel barges in the Ohio river coal trade is as yet only experimental. There can be no question as to the desirability of this type of craft, but experienced river men point to the initial cost, coupled with interest thereon, and to maintenance in the way of cleaning and painting, as objections tending to make the use of steel barges for the transportation of coal to the southern market impracticable. Another obstacle is the limited number of trips that can be made under present river conditions. The average number of such trips per annum runs less than 2; actual average 1.85.

On the other hand, there are those who believe implicitly in the adaptability of the steel barge to the river trade. Among these is

the master of river transportation for the American Steel and Wire Company, on whose representation that company had 10 steel barges built in 1905. In more the succeeding year, and in 1907 was contemplating the construction of an additional [illegible]. He asserts that steel barges should consider large [illegible] wooden barges, and as an example cites the loading of steel barges, of which 3 tons can be loaded by lowering at a single operation, something in his opinion, a wooden barge could not possibly stand. Regarding the sulphuric and other acids discharged into the river from the mills, and attacking the steel hulls, he does not believe that such acids have any appreciable effect. He advances the theory, however, that such acids attack steel only when the water boiling there in solution is boiled in the boilers of river steamers, where the [illegible] effects are impossible, and regarding which there is considerable complaint.

DECLINE OF STEAM-VESSEL TONNAGE

It is possible here to consider steam tonnage only. The navigation laws of the United States do not, as are the commerce laws of a certain class of vessels which are employed to a very considerable extent on the western rivers. Under the laws are found the numbers of unrigged and unmanned barges employed largely in the transportation of coal. The only authentic source from which data bearing on the decline of vessel tonnage on the western rivers can be obtained is the reports of the Bureau of Navigation. These reports, however, due to the reason above given, are not complete, except as to steam tonnage, which under the classification used, includes all boats over 5 tons net, having internal motive power, of their own, and not employed wholly within the borders of a single state.

The following table, compiled from reports of the Commissioner of Navigation, shows the commercial gross steam tonnage of the Mississippi and tributary rivers, by years, for a period of twenty years. The tonnage shown is classified according to size of vessels as follows: Class A includes vessels of from 5 to 100 tons, class B from 100 to 500 tons, class C from 500 to 1,000 tons, and class D from 1,000 to 1,500 tons.

TABLE 6—*Classification by size of vessels composing the steam tonnage of the interior rivers, 1888 to 1907*

Year ending June 30—	Class A, 5 to 100 tons.		Class B, 100 to 500 tons.		Class C, 500 to 1,000 tons.		Class D, 1,000 to 2,500 tons.		Total.	
	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.	No.	Tons.
1888	536	26,824	488	103,387	72	50,495	26	33,330	1,122	214,036
1889	531	27,278	493	103,358	67	49,026	23	30,164	1,114	209,826
1890	519	26,475	475	101,336	71	48,878	22	28,588	1,087	205,277
1891 [a]	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
1892	555	28,802	470	100,263	76	51,156	21	26,779	1,122	207,000
1893	574	29,602	456	97,554	75	50,710	18	23,433	1,123	201,299
1894	573	28,980	426	90,742	71	47,763	17	23,656	1,087	191,141
1895	559	28,276	420	90,242	67	44,615	15	21,309	1,061	184,442
1896	566	28,813	405	86,695	63	41,940	13	18,895	1,047	176,343
1897	577	29,232	393	84,616	66	43,863	12	17,365	1,048	175,076
1898	609	29,508	380	80,729	66	43,947	9	13,113	1,064	167,297
1899	608	29,126	380	80,571	64	42,441	12	17,381	1,064	169,519
1900	654	30,549	370	78,926	67	44,171	10	14,760	1,101	168,406
1901	707	32,469	361	78,052	67	44,346	9	12,752	1,144	167,619
1902	764	33,927	356	76,812	65	43,208	8	12,627	1,193	166,574
1903	816	33,971	350	74,748	65	43,045	10	15,185	1,241	166,949
1904	922	36,572	349	74,477	62	41,257	9	13,571	1,342	165,877
1905	999	37,372	340	72,238	58	38,599	8	11,563	1,405	159,772
1906	1,054	36,565	339	72,289	51	33,784	7	9,954	1,451	152,592
1907	1,099	36,989	325	69,756	52	34,486	8	[b] 11,057	1,484	[b] 152,288
Total decrease in tonnage	.....	.....	.....	.....	.....	.....	.....	.....	.....	61,748
Total increase in number of vessels	.....	.....	.....	.....	.....	.....	.....	.....	362	.....
Increase (+) or decrease (−) per cent	+105	+38	−33	−33	−28	−32	−69	−67	+32	−29
Average size of vessel:										
1888	.....	.....	.....	.....	.....	.....	.....	.....	.....	191
1907	.....	.....	.....	.....	.....	.....	.....	.....	.....	103

[a] No report published.

[b] In addition to the total shown, two vessels of 2,505 tons gross each were permanently documented in 1907. Due to the fact that they do not operate on western rivers the number and tonnage are omitted from this table. The company owning these craft was incorporated under the laws of the State of West Virginia with statutory office at Wheeling, W. Va., from which point the documents were issued. The vessels which are steel dredges operate on the seaboard.

The above table shows a decrease in the total tonnage, of 61,748 gross tons on June 30, 1907, as compared with June 30, 1888, a reduction of 29 per cent, while the vessels have during the same period increased in number to the extent of 362, or 32 per cent.

Each of the four classes into which the vessels are divided, excepting Class A, has decreased as to both number and tonnage. Class D, which comprises the largest steamers, consisted of 26 vessels in 1888, with an aggregate tonnage of 33,330 gross tons. In 1907 this class has been reduced to 8 vessels, aggregating 11,057 gross tons, a decline of 69 per cent in number and 67 per cent in tonnage.

Classes C and B have suffered a like decrease, but not to the same extent, Class C having been reduced 28 per cent in number and 32 per cent in tonnage, while Class B was reduced by 33 per cent in both number and tonnage.

The smallest steamers, those of Class A, show an increase of 105 per cent in number and 39 per cent in tonnage.

The following table further subdivides steam vessels (including gasoline boats) of less than 100 tons on western rivers; and shows that the chief increase especially in number of such boats has been in vessels of less than 50 tons.

TABLE 7—Comparative tonnage of steam vessels of [illegible] tons or upward, [illegible] 1889–1897

Year.	Class 1 (1 to 50 tons).		Class 2 (50 to 100 tons).	
	No.	Tons.	No.	Tons.
1889	270	[illegible]	[illegible]	[illegible]
1890	261	[illegible]	[illegible]	[illegible]
1891				
1892	271	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]
Increase [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]
1899	[illegible]	[illegible]	[illegible]	[illegible]
1901	[illegible]	[illegible]	[illegible]	[illegible]
1902	[illegible]	[illegible]	[illegible]	[illegible]
1903	[illegible]	[illegible]	[illegible]	[illegible]
1904	[illegible]	[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	[illegible]
1907	[illegible]	[illegible]	[illegible]	[illegible]
Increase [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889	270	[illegible]	[illegible]	[illegible]
1907	[illegible]	[illegible]	[illegible]	[illegible]
Net increase [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
			[illegible]	[illegible]
Total increase [illegible]			[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Again, it must be remembered that a large percentage of steamers on these rivers are used for towing barges laden principally with coal. This particular character of vessel falls chiefly under Classes B and C in the table above shown and has probably increased, so that a variation therein would not account for the disappearance of so many Class D vessels which are 1,000 tons and over. The increase in number and tonnage of vessels under 50 tons, as stated above, is accounted for by the introduction of gasoline boats which are of small importance with respect to the great bulk of traffic on the rivers.

On the other hand the report of the United States census shows an increase in both number and tonnage of unrigged craft (or barges) on the Mississippi river and tributaries, as given below:

	Number.	Tonnage.
1889	6,328	3,171,636
1906	8,187	4,265,740

It would therefore seem that, while the decline in steam tonnage is by no means a measure of traffic (in view of the existence of barges), it is nevertheless an evidence of the decline of certain classes of traffic which include nearly all commodities except coal.

A new and increasingly important factor in the local traffic, of the Mississippi Valley and elsewhere, is the gasoline boat. These boats do not compete with the packet lines on through traffic, but they are taking over the local business to a considerable extent. They are active in detached sections of the Ohio from Sistersville, W. Va., as far as Paducah, Ky., and especially in the Little Kanawha, Great Kanawha, and Muskingum rivers and other tributaries of the Ohio. One gasoline boat does not attempt to cover more than 15 or 20 miles, but a series of boats on connecting sections will furnish competition over a considerable distance. Some of the gasoline boats are "tramps,' having no regular route, but go wherever they find business.

These gasoline boats are adapted to carrying a little freight on deck in the bow, but for the greater part of their length they are housed over to furnish quarters for the captain and one or two assistants. This inclosed portion contains also the gasoline engine and tank. These boats are propelled by a stern wheel of the same type as the western river steamboat, but smaller. Freight is generally carried on flats, one (or sometimes two) of which constitutes a tow. These flats carry from 5 to 60 tons, averaging about 25 tons, and their maximum draft when loaded is about 3 feet. With the engines, a gasoline boat costs from $500 to $3,500, the average being about $1,500. The operating expenses of these gasoline boats are less than those of the steamboat, which is said to be due mainly to restrictions placed upon the steamboat by the Government. An ordinary steamer is required to have several licensed men, usually not less than 5 or 6, while a gasoline boat of less than 15 gross tons is required to have only 1 or 2, and this only when it carries passengers for hire. By far the greater part of these boats are under 15 tons. The cost of operating an ordinary river steamer is about $45 per day, and that of a gasoline boat about $5 per day. They will tow a barge in at any point on the river where the farmer or planter has anything to ship and take it to market or its destination at a rate under the steamboat rate. Compe-

union of the gasoline boats has been going on for several years and is increasing every year. Knowing the steamboat rates, they cut them just enough to secure the trade.

Steamboat men become owners of gasoline boats of doing everything in their power to have their boats measure under 15 tons to escape the United States inspection rules. The United States authorities, in computing tonnage, measure only the inclosed portions of the boats, excluding the engine room. Taking advantage of this, so it is claimed, gasoline boats make their engine rooms large, although they may carry passengers and freight therein; and in some cases certain parts of the sides are made adjustable, to be lowered when the inspectors are aboard, to secure this space from computation. As soon as the inspectors are out of sight these sides are raised again.

The gasoline boat under 15 tons is subject to no United States or other official regulation, except that when it carries passengers for hire it must have a licensed operator and life-preservers for all on board. No examination is required to secure such license. Many complaints have been received by the Bureau of Corporations asking:

> Why should these boats be allowed to be propelled by gasoline practically without restriction, when the steamboat, subject to the most rigid rules of inspection and fitted with safety appliances, is not allowed to carry any gasoline, not even an empty barrel that contained it?

OPERATING AGENCIES

Owners of vessels operating on western rivers fall under three groups: *a* individuals, *b* partnerships, *c* corporations organized under State laws. Under this head, of course, are included not only agencies engaged in the regular steamboat service, but also those operating vessels as an adjunct to productive enterprises. Part ownership, the form in which sailing vessel property has been generally held on the North Atlantic coast, has been encountered in only a single instance among the steamboat lines on the western rivers.

Data concerning ownership, together with other information contained in schedules received by the Bureau of Corporations from many of the companies and others operating fleets on western rivers, are set forth in the accompanying table entitled "Operating agencies on interior rivers." Reading from left to right, in the first column of the table is shown the name of the owner of a given fleet; the second shows the form of organization; then follow the name, class, and tonnage, gross and net, of vessels composing the fleet; the nature of the business in which the fleet is engaged, and the character of freight handled. This table is not, however, a complete list of agencies operating on these rivers.

TABLE 8—*Agencies operating on interior rivers*

Name.	Form of organization.	Vessels composing fleets.				Nature of business.	Character of freight handled.
		Name.	Class.	Tonnage.			
				Gross.	Net.		
American Oak Tanning Co. (James E. Mooney).	Individual	American	Steam	171	158	Tramp (boats used principally for company's use).	Bulk.
		Decatur No. 1	do	48	48		
		Meteor	Gasoline	14	14		
		Barge No. 1	Barge	(a)			
		Barge No. 4					
		Barge No. 5					
		Barge No. 6					
		Barge No. 7					
		Barge No. 8					
		Barge No. 10					
		Barge No. 15					
		Barge No. 16					
		Barge No. 18					
		Barge No. 19					
		Barge No. 20					
		Barge No. 22					
		Barge No. 26					
		Barge No. 27					
		Barge No. 28					
		Barge No. 29					
		Dixie	do	250			
Anchor Milling Co	Corporation	J. R. Wells	Steam	206	130	Regular line	Packet and bulk.
		Ida	Barge		43		
Angola Transfer Co	do	Wm. Edenborn	Steam	239		Regular line (car transfer for L. R. & N. R. R.).	Towing freight.
		Angola	Barge	647			
Arkansas River Packet Co	do	S. S. Brown				Regular line	Packet.
Barrett Line	Individual	J. N. Harbin	Steam	341	266	Tramp, towing	
		Lucile Nowland	do	472	298		
		Barrett	Towboat	913	620		
		Beaver	do	314	314		
		Katherine	do	146	146		
		Geo. Gardner	do	72	72		
Bay Line, Ironton, Ohio (so called since 1864; Geo. W. and Wm. Bay, owners).	Partnership	Ruth	Steam	131	131	Regular line	Packet and bulk.
		Ruth No. 2	do	141	141		
		Greyhound b	do	125	125		
Benton Packet Co	Corporation	Weston	do	89	89	do	Do.
		Bismarck	Motor	93	93		
		Expansion	Steam	79	79		
		Washburn	do	57	57		
		Frayne	Barge	83	83		
		Blunt	do	97	97		
		Tolga	do	65	65		
		Odessa	do	73	73		

Blaine Coal Co. (Pittsburg & West Moreland Coal Co., Shoenberger Coal Co.)	do	Nos. 1 to 47, inclusive (47 coal floats)	Barges	[a] 350		do	Bulk
Bindl, A. H., Coal Co	do	A. H. Bindl, 40 barges	Steam barges	140 [b] 1,000		Private, towing	Do
Cairo, Memphis & St. L. R. R. and Transp. Co		Herman Pamphu	Steam (10 barges)	187		Barge line.	
Campbell's Creek Coal Co. (Kanawha and Ohio Transportation Co. Kanawha and Ohio Co.)	do	S. H. Andrews	do	400	501	Towing and private carrier	Do
		Robert P. Gillham	do	168	168		
		D. F. Lane	do	140	140		
		W. H. Cabbleweed	do		80		
Cape Girardeau Transportation Co	do	Eagle	do	185	185	Towing logs	Do
		Eolia	do	10	10		
Carnival City Packet Co. (White Collar Line)	do	Silver Crescent	do	130	130	Regular line [c]	Packet
		Helen Blair	do	314	314		
		Columbia	do	333	333		
Cincinnati, Pomeroy and Charleston Packet Co	do	Henry M. Stanley	do	303	303	Regular line	Packet and bulk.
		Tacoma	do	370	370		
		Capitol	do	300	300		
		Chilo	do	90	90		
Cincinnati, Portsmouth, Big Sandy and Pomeroy Packet Co	do	Romanza	do	241	241	(e)	(e)
Clyde Coal Co	Corporation	Pleasant	do	100	87	Towing and private carrier	Bulk
		Clyde	do	187	90		
		60 flats		(d)			
		1 barge		(d)			
Collins & Hartwig Co	do	J. H. Lewis [f]	Tow boat	103	103	Towing	Do.
		30 barges		800			
		1 flat		100			
Consolidated Coal Co. of St. Louis	do	Hellmann	Tug	80	47	Private carrier, towing	
		Bow		180			
		do		180			
		do		180			
		do		180			
Cottell, Robert	Individual	Cottell	Steam tow	104	90	Towing	
Cumberland and Tennessee Transportation Co	do	C. M. Pate	Steam	83	83	Regular line	Packet and bulk.
		Dick Clyde	do	70	70		
		4 barges	Coal capacity	[g] 800			
		19 barges	do	[g] 3,800			
		6 flats	do	[g] 300			
Diamond Coal & Coke Co	do	Monitor	do	231	140	Private carrier and towing	Bulk.
		Vulcan	do	90	90		
		Hunter No. 3	do	91	91		
		50 flats		[g] 800			

[a] The average tonnage for these numbered barges is 300 tons.
[b] Each.
[c] Greyhound only one operated in 1906, as other two were sold early in 1906.
[d] Steamer Columbia makes excursion trips in addition to her regular schedule.
[e] This company owns but one boat, which is laid up. Business formerly passenger.
[f] About 200 tons coal capacity each.
[g] 600 tons coal capacity.
[h] Steamer J. R. Lewis is owned by the Chesapeake Mining Co., of Handley, W. Va. This company also owns 30 barges of 800 tons each.
[i] In port of St. Louis. Coal delivered to steamers

TABLE 8—*Agencies operating on interior rivers*—Continued

Name.	Form of organization.	Vessels composing fleets.				Nature of business.	Character of freight handled.
		Name.	Class.	Tonnage.			
				Gross.	Net.		
Diamond Jo Line Steamers[a]	Individual	Saint Paul	Steam	832	832	Regular line	Packet, bulk, and passenger.
		Quincy	do	806	806		
		Dubuque	do	748	748		
		Sidney	do	617	378		
Dilworth Coal Co	do	H. P. Dilworth	do	123	123	do	Do.
		Barges 201, 202, 203, 204, 205, and 206.		[b] 570			
		61 flats, 15 to 154		[b] 200			
Eagle Packet Co	do	Cape Girardeau	Steam	747	498	do	Do.
		Grey Eagle	do	555	555		
		Spread Eagle	do	691	691		
		Bald Eagle	do	468	468		
		Fuel Flat No. 1					
		Fuel Flat No. 2					
Eclipse Co. of Le Claire	do	Eclipse	do	202	148		Packet.
Evansville, Paducah and Cairo Packet Line.	do	John S. Hopkins	do	593	452	Regular line	Packet and bulk.
		Joe Fowler	do	356	356		
Evansville and Bowling Green Packet Co.	do	Bowling Green	do	123	123	do	Packet, bulk, and passenger.
		Evansville	do	144	144		
		Park City	do	197	197		
		Chaperon	do	95	95		
Hickey, E. J., Transportation Co	do	J. T. Hatfield	Towboat	153	153	Towing	Bulk.
		83 barges		550			
		19 flats		[c] 250			
Inman Packet Co. (Inman-Decker Packet Co.)	Partnership	Geo. Pope	Steam	97	62		
		Minnehaha	do	46	46	do	Packet and bulk.
Iron City Sand Co	Corporation	Diamond	Steam tow	118	75	Private carrier	Bulk.
		4 dredges	Dredges				
		181 flats	90 by 16 by 5	([d])			
Knox, Sevier and Jefferson Boat Co.[e]	Individual	John Austin	Steam	86	86		Packet and bulk.
C. Jutte & Co. (Peoples Coal Co. Monongahela & Western Dredging Co., Jung & Sons Coal Co.)	Corporation	Oakland	do	628	628	Towing	Bulk.
		Gleaner	do	714	576		
		Crescent	do	239	239		
		G. W. Thomas	do	281	110		
		Charlie Jutte	do	281	110		
		P. M. Pfeil	do	116	74		
		163 coal boats		[b] 1,000			
		58 barges		[b] 600			
		31 flats		[b] 300			
La Salle and Peoria Packet Co.[f]		Fred Swain	Steam	220	124	Regular line	Passenger and packet.
		David Swain	do	156	118		

Lee Line (Branch of Louisville Packet Co., Limited)		Fred Hopkins	do	1881	1881	do	Packet, bulk, and passenger
		Quinnipiac Lee	do	381	140		
		Harry Lee	do	381	381		
		James Lee	do	381	401		
		Peters Lee	do	403	341		
		Stephen Lee	do	710	710		
		Sallie Lee	do	347	108		
		Ann Cadell	do	81	81		
Louisville and Cincinnati Packet Co	Corporation	City of Louisville	do	1,021	1,141	do	Packet
		City of Cincinnati	do	810	1145		
		Indiana	do	831	414		
		Robert M. Gould	do	308	308		
		Uncle Ben	do	109	109		
		Hattie Brown	do	79	79		
Louisville and Evansville Packet Co	do	Morning Star	do	313	413	do	Packet, bulk, and passenger
		Bellaire	do	801	701		
		Paducah	do	172	172		
		Shawnee	do	178	178		
		Bellevue	Towing	81	81		
Lyon Packet Co	do	Speed	Steam	93	93	do	Packet and bulk
		Lulla Brown	do	113	113		
Maitland Coal Corporation	do	Uncle Harold	Tug	98	98	Towing	Bulk
Marmet Coal Co	do	Thomas Marmet	Towboat	311	311	Private carrier	Do
		Uncle Marmet	do	183	183		
Memphis and Arkansas City Packet Co	do	Kate Adams	Steam	333	333	Regular line	Packed and bulk
Mississippi Packet Co	do	St. James	do	317	317	do	Do
		Mabel Crymens	do	144	144		
		Imperial[5]	do	404	404		
Mississippi, Vasser & Sunflower River Transp. Co	do	Fawn	do	40	40	Towing	
		Sam A. Conner	do	113	113	do	
Monongahela River Consolidated Coal and Coke Co. (Huntington and St. Louis Towboat Co.)[6]	do	Aid	Tug	7	7	Private carrier[7]	Bulk
		Harry Brown	do	194	194		
		Alice Brown		331	331		
		Charles Brown	Steam	344	344		
		Sam Brown	do	401	110		
		Tim Brown	do	131	131		
		Nellie Brown	do	70	70		
		Bertha	do	103	103		
		Boys	do	131	131		
		J. N. Hunton No. 3	do	100	143		
		Cruiser	do	341	341		
		Charlie Clark	do	147	147		

[1] Also owns barges Midland, Lusk, and Gary; 1 wharf boat at St. Louis, Mo.
[2] Each.
[3] Coal capacity (each).
[4] Plates only 3,000 bushels of sand or gravel; sand, gravel, bottom gravel, gravel, bottom.
[5] This company alternates each month with the French Broad Navigation Co.
[6] Operated only 1 boat in 1908.
[7] Also 100 barges and coal flats.
[8] Imperial under supervision of the Natchez Transportation Co., New Orleans, La., for past three years.
[9] The fleet of this company, including barges, consists of about 4,000 craft.
[10] Commodities other than coal are carried for others, but the company claims that they do not engage in the transportation business as a common carrier.

TABLE 8—*Agencies operating on interior rivers*—Continued

Name.	Form of organization.	Vessels composing fleets.				Nature of business.	Character of freight handled.
		Name.	Class.	Tonnage.			
				Gross.	Net.		
Monongahela River Consolidated Coal and Coke Co. (Huntington and St. Louis Towboat Co.) (continued).	Corporation	Corsair	Tug	95	47		
		Clipper	Steam	185	111		
		Josh Cook	do	384	384		
		Sam. Clark	do	435	435		
		Coal City	do	361	361		
		Carrie B	Tug	27	23		
		Carbon	Steam	121	77		
		Cadet	do	122	77		
		Crusader	do	137	87		
		S. H. H. Clark	do	711	711		
		M. Dougherty	Tug	43	43		
		Tom Dodsworth	Steam	500	500		
		Delta	do	97	97		
		Enterprise	do	297	188		
		Exporter	do	578	578		
		Faltie	do	302	201		
		J. B. Finley	do	679	679		
		Fulton	do	53	53		
		Wash Gray	Tug	105	66		
		Thomas Heidel	do	10	5		
		Raymond Horner	Steam	688	688		
		Wash Hornshell	do	134	134		
		Fred Hartweg	do	391	246		
		Iron Age	do	385	385		
		Ironsides	do	282	282		
		N. M. Jones	Tug	34	17		
		Robert Jenkins	Steam	242	147		
		H. P. Jones	do	146	119		
		Little Fred	do	126	126		
		Tom Lysle	do	121	120		
		Laurel	Tug	67	37		
		Henry Lowrey	Steam	646	646		
		James Moren	do	602	371		
		John Moren	do	284	220		
		Stella Moren	do	215	149		
		Mariner	do	371	371		
		Monterey	do	107	74		
		Rover	do	145	92		
		Major	Tug	60	41		
		W. W. O'Neil	Steam	778	778		
		S. S. Prentiss	Tug	61	42		

TABLE 8.—*Agencies operating on interior rivers*—Continued

Name	Form of organization.	Vessels composing fleets. Name.	Class.	Tonnage. Gross.	Tonnage. Net.	Nature of business.	Character of freight handled.
Parker Line	Individual	Bob Blanks	Steam	265	265	Regular line	Packet and bulk.
		Frank B. Hayes	do	89	89		
People's Coal Co. (C. Jutte & Co., Monongahela and Western Dredging Co., Jutte and Sons Coal Co., agents).	Corporation	W. C. Jutte	do	113	72	Private carrier	Bulk.
		R. L. Aubrey	do	99	63		
		73 barges			[b] 600		
		89 flats			[b] 300		
Pittsburg Dredging and Construction Co. (Dilworth Dredging Co.).	do	John F. Klein	Steam	123	78		Contract dredging; also towing.
		3 dredge boats (1,000 cubic yards capacity each per day).					
		3 scows (side dump).					
Pittsburg, Wheeling and Parkersburg Packet Co.	Partnership	Ben Hur	do	284	284	Regular line	Packet and bulk.
		Bessie Smith	do	127	127		
		H. K. Bedford	do	139	139		
Pittsburg and Cincinnati Packet Line	Corporation	Keystone State	do	599	599	do	Passenger, packet, and bulk.
		Queen City	do	624	624		
		Virginia	do	628	628		
Pittsburg and Westmoreland Coal Co. (Blaine Coal Co., Shoenberger Coal Co.).	do						
Planters Packet Co.	do	City of St. Joseph	do	182	182	Regular line	Packet and bulk.
Preston, S. L. & Son	Partnership	John A	do	13	13	Towing[d]	Bulk.
Red River L. T. and Transportation Company.	Corporation	Eagle	Towing	(c)	(c)	Towing	Do.
		Gov. Pope	do				
		Starr	do				
Rodgers Sand Co.	do	Charlotte	Towboat	163	103	Private carrier	Do.
		Rebecca	do	159	159		
		Harriet	do	159	159		
		Margaret	do	128	81		
Ryman Line	do	Electra	Steam	372	273	Regular line	Packet and bulk.
		J. B. Richardson	do	191	191		
		R. Dunbar	do	252	158		
		H. W. Buttorff	do	254	160		
		Bob Dudley	do	196	159		
		Henry Harley	do	162	162		
St. Louis Steel Barge Co.	do	McDougall	Steam tow	562	383	Towing	Bulk.
		A	Barge	1,162	1,162		

St. Louis and Tennessee River Packet Co.	do	City of Memphis	Steam	[illegible]	[illegible]	Regular line	Packet, bulk, and towing
		City of Saltillo	do	372	372		
		City of Savannah	do	[illegible]	[illegible]		
		Eastlake	do	[illegible]	[illegible]		
		Clyde		[illegible]	[illegible]		
		Shiloh	Steam	140	140		
		Lupton	Barge	100	100		
		Bulmer	do	100	100		
		Marietta	do	100	100		
		Irwin	do	100	100		
Saltwing Lumber and Shingle Co. (Limited)	do	Curtis H. Robertson	Steam	55	55	Towing timber	Bulk.
		Maud	do	20	15		
		Tuna	Gasoline			Private service	
		Little Curtis H.	do				
Sharpsburg Sand Co.	do	E. H. Hamilton	Steam tug	84	84	Private towing	Inc.
		W. H. Graham	Towing tug	187	80		
		F. T. Gaston	do	170	113		
		Geo. Howell	do	40	40		
		Dalton	Pump boat				
Shoenberger Coal Co. (Pittsburg and Westmoreland Coal Co., Blaine Coal Co.)	do	10 flat boats					
		No. 3 to 10		336			
		No. 1 and 2		336			
		No. 13A		400			
Tennessee and French Broad Navigation Co. (Upper Davidson, Knoxville, Boyd, and Infinson Boat Co. Tenight Tariff of Tennessee River Navigation Co.)	Individual	Catherine F. G.	Tug		60	Regular line	Packet and bulk.
		1	Barge		45		
		3	do		45		
		8	do		45		
		4	do		45		
		5	do		45		
Union Sand and Material Co.	Corporation	Colorado	Tug	45	55	Private towing	Bulk
		Hulp. E. Carr	Harbor steam tug	30	10		
		Virginia	do	41	55		
		Margaret	Towboat	100	100		
		27 barges (from 300 to 500 tons capacity each)			13,500		
		6 bridge boats			7,000		

a Have also a small boat which operates in small streams.
b Coal capacity (approximate).
c This company has no navigation interests. Controls the two companies separately.
d Low for the Ohio River Sawmill Co., Louisville, Ky.
e All less than 100 tons.
f Merchant floating steam hoists are as follows: No. 1, 1840; No. 2, 1890; No. 3 and 4, 1891. These are used to load sand from the flatboats to cars for shipment. All flat boats per ring 130 tons of sand each, 1890 not. 2 barges 1 of which is center dump and the other side dump.
g Blaine Coal Co. leases their flat boats to the Shoenberger Coal Co. and they take and operate boats of both as one fleet, making a nominal charge per ton. Towing done by Diamond Coal Co.
h These boats are given under P. & W. Coal Co.
i Total capacity.
j Each.

TABLE 8—*Agencies operating on interior rivers*—Continued

Name.	Form of organization.	Vessels composing fleets.				Nature of business.	Character of freight handled.
		Name.	Class.	Tonnage.			
				Gross.	Net.		
United Coal Co.[a]	Corporation	Helen White	Steam tow	174	174	Private towing	Bulk.
		48 barges, 26 by 135		[b]720,000			
		6 flats, 20 by 100		[b]42,000			
		2 flats, 20 by 100		[b]13,000			
		3 flats, 20 by 90		[b]15,000			
		28 flats, 18 by 90		[b]15,400			
Vesta Coal Co. Jones and Laughlin Steel Co.	do	Henry A. Laughlin	Steam	151	95	Private carrier	Do.
		Vesta	do	142	90		
		Dalton	do	193	122		
		Titan	do	195	123		
		Sailor	do	140	88		
		160 barges			[c]300		
		31 barges			[c]500		
Vicksburg and Greenville Packet Co.	do	Belle of the Bends	Steam	405	374	Regular line	Passenger and packet.
Whitney, A. J.	Individual	A. J. Whitney	do	72	72	Government towing	
		10 flatboats		800	800		

[a] Towing done by Diamond Coal Co., C. Jutte & Co., Peoples Coal Co., at Pittsburg. Harbor towing at Cincinnati, Ohio, done by Wash. Miller and Licking Coal and Towboat Co. The Helen White does some work from Fayette City, Pa., to Pittsburg and Cincinnati, Ohio; does some towing from Pittsburg to Cincinnati.
[b] Bushels.
[c] Each.

OHIO RIVER TRAFFIC

The traffic movement on the Ohio River consists of package freight and bulk freight. The former includes merchandise, manufactured products, and farm products transported by individual vessels or fleets of steam packet boats owned by corporations and operated on various sections of the river. Bulk freight consists mainly of coal mined by fleets of large coal companies, with headquarters at Pittsburg, notably the Monongahela River Consolidated Coal and Coke Company, a subsidiary concern of the Pittsburg Coal Company. There is also a considerable movement of logs and rafts out of the tributaries of the Ohio to sawmills at such points as Cincinnati and Evansville.

The railroads in many ways hinder the development of river traffic. At Pittsburg and other points on the river the railroads have gained control of most of the best available for landing and terminal facilities, and have also occupied long stretches of the river banks with railroad tracks. The railroad control of terminal facilities and their unwillingness to permit arrangements with the river lines are discussed in other sections of this Appendix.

PACKET LINES ON OHIO RIVER

It is important to note that in addition to the regular packet lines owned by corporations there are many boats on the Ohio owned by individuals and partnerships, as well as numerous pleasure boats. The following are the more important packet lines transporting package freight on the Monongahela and the Ohio rivers:

1. **Monongahela and Ohio Packet Company.** A West Virginia corporation organized in May, 1906. Capital stock authorized $50,000; issued $37,000. Operates a fleet of 3 steamers on the Monongahela River. Formerly the property of the Pittsburg and Morgantown Packet Company, and during 1906 operated from Pittsburg to Brownsville, Pa., and Morgantown, W. Va.; in 1907, on the completion of the old Baltimore and Ohio Railroad bridge below Fairmont, W. Va., extended its line to the latter point. Traffic consists of general merchandise.

2. **Pittsburg, Wheeling and Parkersburg Packet Line.** A partnership established in 1906. Operates a fleet of 3 steamers between Pittsburg and Parkersburg, W. Va. Railroads do not operate.

3. **Pittsburg and Cincinnati Packet Line.** Incorporated in 1905 under the laws of West Virginia. Capital stock authorized $250,000; issued $187,500. Operates a fleet of 3 steamers between Pittsburg and Cincinnati and at important intermediate points, carrying bulk and package merchandise, glassware, and merchandise, mixed with farm products, whisky, wooden ware, furniture, and market goods. Joint freight rates with the Louisville and Nashville railroad to Nashville and Chattanooga, Tenn. Formerly had pooling arrangements with other railroads reaching the South and West, but these arrangements with water lines were withdrawn by the railroads about 1907, with the exception of the South.

4. **Muskingum and Ohio River Transportation Company.** Incorporated in 1907 under the laws of Ohio. Capital stock $24,000.

Operates 1 steamer between Pittsburg, Pa., and Zanesville, Ohio. Carries live stock, farm products, pottery and sewer pipe, manufactured iron, and general merchandise.

5. Ohio and Great Kanawha River Packet Company, a partnership, operating 1 steamer between Charleston, W. Va., and Pittsburg, which carries iron and steel manufactures, farm products, and general merchandise.

6. Ohio and West Virginia Transportation Company. Incorporated in 1904 under the laws of Ohio. Capital stock, $25,000. Operates 2 vessels between Marietta, Ohio, and Sistersville, W. Va., and Middleport, Ohio, carrying general merchandise.

7. Cincinnati, Pomeroy and Charleston Packet Company. Incorporated in 1905 under the laws of Ohio. Capital stock, $50,000. Operates a fleet of 4 steamers between Cincinnati, Ohio, and Charleston, W. Va., Huntington, W. Va., Pomeroy, Ohio, Maysville, Ky., and Chilo, Ohio, carrying general merchandise east and farm products west. Railroads do not prorate. The general manager of this company operates 1 steamer between Pittsburg, Pa., and Charleston, W. Va., under the name of the Pittsburg and Kanawha River Packet Company.

8. Cincinnati, Portsmouth, Big Sandy and Pomeroy Packet Company. Incorporated in 1873 under the laws of Ohio. Capital stock, $150,000; bonded indebtedness, $28,000. Owns 1 steamer, but expects to go out of business, and states that the Cincinnati, Pomeroy and Charleston Packet Company is operating boats where this company formerly operated.

9. Louisville and Cincinnati Packet Company. Incorporated in 1894 under the laws of Kentucky, as successor to the United States Mail Line. Capital stock, $250,000. Operates a fleet of 6 steamers between Cincinnati, Ohio, and Louisville, Ky., and Madison, Ind., and from Madison, Ind., to Carrollton and Warsaw, Ky., carrying passengers and all kinds of freight except bulk grain and freight too large to handle. Railroads do not prorate.

10. Evansville and Bowling Green Packet Company. Incorporated in 1898 under the laws of Indiana. Capital stock, $20,000. Operates a fleet of 4 stern-wheel steamers between Evansville, Ind., and Bowling Green, Ky., Mammoth Cave, Ky., and intermediate landings on Green and Barren rivers in Kentucky, carrying merchandise and farm and forest products. Railroads prorate between certain points where through tariffs are published and in effect.

11. Louisville and Evansville Packet Company. Incorporated in 1902, under the laws of Kentucky, as successor to the Louisville and Evansville Mail Line. Capital stock, $90,000; bonded indebtedness, $170,000. Operates a fleet of 4 steamers and 1 towboat, carrying general merchandise, farm products, and passengers. Railroads prorate on joint tariffs.

12. Evansville, Paducah and Cairo Packet Line. Incorporated in 1904 under the laws of Indiana. Capital stock, $25,000. Operates 2 steamers between Evansville, Ind., and Paducah, Ky., connecting for Cairo, Ill., carrying fluor-spar, general merchandise, and farm products. Stated that railroads do not prorate.

13. Ryman Line. Incorporated in 1904 under the laws of Tennessee. Capital stock authorized, $100,000; issued, $57,000. Operates

a fleet of 6 steamers between Nashville, Tenn., and Evansville, Ind., Paducah, Mills Springs, and Albany, Ky., carrying passengers, live stock, grain of all kinds, poultry, eggs, and general merchandise. Railroads provide with this line.

14. Cumberland and Tennessee Transportation Company. Incorporated under the laws of Kentucky. Capital stock, $40,000. Operates 2 steamers and 10 barges between Nashville, Tenn., and Burnsville, Ky., and also to Carthage, Tenn., handling staves, lumber, cross-ties, and coal. Railroads provide.

15. St. Louis and Tennessee River Packet Company. Incorporated April 13, 1887, under the laws of Missouri. Capital stock, $300,000. Operates a fleet of 6 freight and passenger steamers and 4 barges between St. Louis, Mo., and Waterloo, Ala., from Decatur to Savannah, Tenn., and from Waterloo, Ala., to Paducah, Ky., and Florence, Ala., carrying general merchandise from St. Louis to the Tennessee River with return freight products. In response to interrogatory relating to profiting advantages to the company stated: By the combination of the two lines we handle some through business beyond our direct line.

ASSOCIATIONS OF OHIO RIVER LINES

So far as the Bureau of Corporations has been able to learn there is only one association of Ohio River lines namely, the Pittsburg Coal Exchange, whose name does not indicate its purpose. This is an organization of steamboat packet lines, coal operators, and business men of the steamboat towns of Pittsburg, with partners as well as packet lines whose who are not members affiliating with it, have getting organized. The present organization of the exchange dates from 1897, but its informal organization extends back for many years.

The association purposes of the Pittsburg Coal Exchange are the protection of navigable in navigation, the removal of obstructions in the river, the creation of a waterway favorable to river improvement, and the enforcement of river legislation. In pursuance to list of members, Capt. J. F. Tilney of the Monongahela River Consolidated Coal and Coke Company is secretary of the Pittsburg Coal Exchange.

RIVER TRAFFIC

The commerce the main navigation of the Ohio and its tributaries. The principal traffic is in coal, but there is also some traffic in lumber, sand, stone products, iron and farm products, chiefly grain. There are mines of coal along the Monongahela, but nearly all of the coal the shipments.

[illegible]

By far the most important of the shipments are to one of self-contained from the coal regions of the Monongahela and Kanawha rivers and from Pittsburg, Beaver, and Huntington, W. Va., on the Ohio. Coal mines on the Ohio and small mines in the Pittsburg district are brought down the Monongahela River, the coal of it from the first four

"pools." There is more or less extensive movement of coal in the "short river" trade as far as Cincinnati; and coal is also transported to all important industrial centers on the lower Ohio and lower Mississippi, as far south as New Orleans, in what is known as the "long-river" trade.

Twenty-five barges and coal boats, carrying from 12,000 to 20,000 tons of coal usually make a fleet in the upper Ohio. Below Louisville, where is situated the Louisville and Portland Canal, around the Falls of the Ohio, the fleets are enlarged, and carried downstream by larger steamers or towboats. Full-sized tows include from 35,000 to 50,000 tons of coal, and there is a record tow of 56,000 tons passing Memphis.

1. The Monongahela River Consolidated Coal and Coke Company is the largest bulk carrier of coal on the Ohio and Mississippi rivers. It was incorporated in 1899 as successor to a number of small companies, and is controlled through stock ownership by the Pittsburg Coal Company. It operates a fleet of 80 towboats and steamers and about 4,000 coal boats, barges, and other craft. The cargo-carrying craft represents a total tonnage of 2,785,000 tons.

Since its organization this company has towed more than 30,000,000 tons of its own coal. It maintains distributing and retailing centers at Pittsburg, Cincinnati, Louisville, Evansville, Paducah, Cairo, Memphis, Helena, Vicksburg, Natchez, Baton Rouge, and New Orleans.

In 1906 the total river coal shipments of this company amounted to 4,698,527 tons, of which 4,677,709 tons were from its mines on the Monongahela River and 20,818 tons from its mines at Dekoven, Ky. The deliveries of this immense tonnage are set forth in the following table:

River coal deliveries of Monongahela River Consolidated Coal and Coke Company, 1906

	Quantity.		Quantity.
	Tons.		*Tons.*
Pittsburg, Pa	2,298,398	Helena, Ark	7,329
Cincinnati, Ohio	731,519	Greenville, Miss	11,344
Louisville, Ky	553,963	Vicksburg, Miss	39,696
Paducah, Ky	10,440	Natchez, Miss	36,085
Evansville, Ind	15,497	Bayou Sara, La	11,984
Cairo, Ill	44,563	Baton Rouge, La	9,403
St. Louis, Mo	164,200	New Orleans, La	702,906
Hickman, Ky	7,849		
Memphis, Tenn	53,351	Total	4,698,527

In this same year this company's vessels carried 7,790 tons of iron and steel manufactured products from Pittsburg to Louisville; and 51,653 tons to Cairo and other points south. Of glassware, 136 tons were carried from Pittsburg to New Orleans. The upriver movement consists of sugar, molasses, and lumber.

In regard to the effect of the organization of this company on rates the following information has been secured. Before the formation of the Monongahela River Consolidated Coal and Coke Company there was an extensive river business in transporting paving bricks and blocks from New Cumberland, W. Va.; but after the organization of the Monongahela River Consolidated Coal and

pany, Collins and Hartweg, The Otto Marmet Coal and Mining Company, and the Winifrede Coal Company. The Monongahela River Consolidated Coal and Coke Company also buys coal on the Kanawha River for shipment downstream. The market of the Kanawha coal is principally at Cincinnati, and at Newport and Covington, Ky.

The United States Coal and Oil Company, of Holden, W. Va., ship coal by river from Huntington, W. Va., to an elevator owned by them at Sekidan (North Bend), Ohio, a few miles below Cincinnati. From their elevator at Sekidan they have an extensive rail business and maintain a sales office at Cincinnati in the name of the Island Creek Fuel Company. On the river the coal of the United States Coal and Oil Company is known as the Island Creek coal.

T. J. Hall & Co. and others carry coal from tipples at Pomeroy Bend in the Ohio.

CINCINNATI AS A DISTRIBUTING POINT FOR COAL*

River coal forms a considerable factor in the local trade at Cincinnati, and there are 14 coal elevators on the river at Cincinnati and 8 more on the Kentucky side. Formerly Cincinnati was also an important distributing point for river coal; but this trade has largely disappeared. No coal is now shipped by river from Cincinnati except such as may be held there for a time on its way down the river, and such cargoes are not rehandled at Cincinnati. Rail shipments of river coal from Cincinnati are made principally to southeastern Indiana, to the district outlined by the cities of Jeffersonville, Indianapolis, and Richmond. Some shipments are made to points in Indiana outside of this territory. Some of these points are reached only at a premium over all rail shipments, as the river coal is said to be more desirable for domestic purposes on account of the rescreening at Cincinnati.

Much the greater share of the coal distributed by rail from Cincinnati is of coal received at Cincinnati by rail. This coal is brought to Cincinnati by the following railroads: Chesapeake and Ohio, Norfolk and Western, Baltimore and Ohio Southwestern, Louisville and Nashville, and Queen and Crescent.

Much of this rail coal is consumed at Cincinnati and vicinity, but the greater part of it is turned over to other railroads at Cincinnati—such as the Big Four; Cincinnati, Hamilton and Dayton, and the Pennsylvania lines, and consigned to points in the Northwest and to Canada. This all-rail trade to the Northwest includes Chicago and points in Wisconsin, Minnesota, North and South Dakota, and Iowa.

Other rail coal that finds a market in the Middle West includes coal mined in the Jackson (Ohio) district, and around Terre Haute, Ind. Some coal also appears to be hauled from the Pittsburg (Pa.) district by the all-rail route. These rail coals come in competition with the river coal from Cincinnati, and it is claimed that the rail rates are adjusted to favor the rail coal at the expense of the river coal.

In an interview with an agent of the Bureau of Corporations, an officer of a commercial association at Cincinnati made the following statement in regard to the effect of the development of the railroad coal business on the Ohio river traffic:

Before the Chesapeake and Ohio Railroad was built into Cincinnati about 1888 or 1889 the greater part of the coal used there came out of central and southern Ohio as well as in central and southern Indiana was brought down the Ohio River in barges from the Pittsburg and Kanawha River coal districts. The Cincinnati, Washington and Baltimore Railroad, running between Parkersburg and Cincinnati, had its mines on its line and having its terminus nearest to coal as a producer was not needed to serve coal in Cincinnati. The Ohio and Mississippi Railroad, running from Cincinnati to St. Louis, was very glad to serve coal since it gave them a traffic movement out of Cincinnati.

The Cincinnati, Washington and Baltimore road became the Baltimore and Ohio Southwestern, after which it acquired the Ohio and Mississippi Railroad. After this merger the Baltimore and Ohio took over the consolidated companies. At the same time the attitude of the road began to change. The Baltimore and Ohio had coal mines on its line in the Pittsburg, W. Va., district and about 1897 the officials of the Baltimore and Ohio Southwestern became interested in coal property at Luring, Lincoln County, Ohio, and the railroad company built a tunnel to the mine, two miles distant, at Cincinnati for the use of the company running Luring coal. It became a fire Cincinnati market.

The officials of the railroad being stockholders of the coal company made sales from Luring to Cincinnati which were sufficiently low to compete with the other coal in the Cincinnati market, and an attempt was made to fix the rate so that other coal would be excluded. They made some sales to the coal companies, but this coal cut a big figure in the market until its better grade became exhausted. This and the general improvement of the Baltimore and Ohio, of the Baltimore and Ohio Southwestern changed the attitude of these roads toward river coal, and their rates to points north and west of Cincinnati and their switching charges at Cincinnati were adjusted to aid the coal trade at Luring and Pittsburg.

As the better quality of the Luring seams became exhausted during the last few years its influence in the market became diminished, and the Baltimore and Ohio sought to aid the development of the mines around Pittsburg, W. Va., also on their lines. The coal company that had been built at Cincinnati for the use of the Luring coal company passed into the hands of the Pittsburg coal company, and the influence of the Baltimore and Ohio was transferred to that company, including the Summit coal company and the Consolidated coal company.

Shipment of the coal from Cincinnati through Indiana and Illinois has been extensive. The industry came largely from the Pittsburg and Kanawha districts by river, but recently the Baltimore and Ohio Southwestern and the Pittsburg, Cincinnati, Chicago and St. Louis railroads have advanced rates from Cincinnati in order to enforce the use of coal from the Pittsburg and Kanawha districts.

The coal firm of W. H. Brown & Son, affiliated with the **Monongahela River Consolidated Coal and Coke Company**, whose elevator is located on the Pittsburg, Cincinnati, Chicago and St. Louis, or Short-Cut, connection, desired to make arrangements with the **Baltimore and Ohio Southwestern** to assist the switching charge of 5 cents per ton by allowing it on the through rate on shipments destined to points on its line. Although at first refusing to make this arrangement, the railroad company has since made the concession asked, and at the present time makes the same rate from Brown's Siding elevator to points on the Baltimore and Ohio Southwestern as to elevators located on its own track.

At the time the above proposal was made the switching charge of the Cincinnati Street Connection, in which Brown's Siding elevator is located, were based upon the distance by rails rather than the Baltimore and Ohio Southwestern belting out of Cincinnati. For instance the freight rate on a shipment of coal from a mine to some point, say, on the Cincinnati, Hamilton and Dayton from the point where the Cincinnati Street Connection crossed that road, would be 3½ cents per ton. To this the switching charge would be added. This charge by the Cincinnati Street Connection is 5 cents per ton, with a maximum

mum of $2 per car. Assuming that the shipment is a full car of 30 tons, the switching charge on this would be $2.40 and the freight rate from the point of delivery to the Cincinnati, Hamilton and Dayton to the point of destination would be $9, or a total of $11.40. This would be 38 cents per ton from the Cincinnati elevator to the point of destination.

This switching charge is a very elastic quantity. Formerly it was a flat rate of $1.50 per car. Then the Baltimore and Ohio Southwestern raised its charge to 8 cents per ton, an increase of 3 cents per ton on 30-ton cars.

In addition to this switching charge, the Baltimore and Ohio Southwestern and the Pittsburg, Cincinnati, Chicago and St. Louis have recently gotten together and made arrangements to advance rates on gas coal from Cincinnati from 15 cents to 20 cents per ton to points north and west on those two roads—particularly to points in southern Indiana and Illinois.

Coal coming by river to Cincinnati can not, therefore, profitably go out on the Baltimore and Ohio Southwestern to nearby points owing to the above charges for switching. The river business has thus been practically killed to suburban points around Cincinnati and materially diminished to points in Indiana and Illinois.

A Cincinnati operator in river coal cites other instances of what he calls the "fence" the railroad interests have been building for a number of years back around the coal operators that make use of the river for transportation. He asserts that—

> the fence has been built so high, and has been moved in a little more every year, until it is so close to Cincinnati that river coal can not compete with this all-rail coal that comes from the same districts, in the outskirts of Cincinnati, although it can where the coal has to be hauled by wagons farther in the city of Cincinnati.

He also states:

> We formerly enjoyed a fine trade out on the Louisville and Nashville Railroad, but some years ago that road, in the interest of its coal mines in Tennessee and southern Kentucky, advanced the rates south on their road to as much as for going 25 to 50 miles as they charge for bringing coal from Tennessee mines to Cincinnati, the whole distance. Of course this resulted in cutting us out of business.

This operator thinks there should be a law whereby terminal and switching charges should be just as low on river coal as is paid, aside from rebates or other offsets, on coal that comes in from the same initial sections on railroads. He concludes:

> Protection of this character will be necessary on coal, and we presume on other goods, particularly large bulk commodities, if the rivers are to continue unhampered in their usefulness, and the people are to have the benefit of the large sums of money which are being and should be spent upon navigable waters of the United States, particularly those of the Ohio Valley.

River Sand

A number of companies are engaged in dredging and delivering sand and gravel from the Monongahela, Allegheny, and Ohio rivers in the neighborhood of Pittsburg, and from the Ohio river at other points. This sand and gravel is largely used in building operations, more especially in all kinds of concrete work. Sand is also extensively used in the steel and glass industries around Pittsburg.

Logs

From the forests in West Virginia and Kentucky, the Ohio River receives great quantities of logs of poplar, oak, walnut, and other woods, which are brought by small rivers to the smaller rivers and floated from points as far as 50 miles back from these streams. They are floated down the creeks and rivers to the Ohio, where they are made into rafts and towed to mills at points along the Ohio. At Cincinnati are several important mills. At the logs used at the mills of one of the largest companies are brought by river, the cost of this river transportation being estimated at about 50 cents per thousand feet. The rail rates on these logs are prohibitive, amounting to 10 and 15 cents per hundred, making a cost of about $4.50 per thousand feet delivered at Cincinnati. Logs and railroad ties are also received by river at Evansville, coming from the Green, Wabash, Tradewater, Saline, and Cumberland rivers. Most of this lumber is cut by small sawmills and gangsaws locally. The logs are sawed at Evansville, a considerable proportion entering the export trade.

It is thought that water transportation makes an annual saving to the lumber operators of the Ohio Valley of about $3,000,000.

Coal

Coal principally mined in Pennsylvania, Ohio, and Pocahontas Va., and in the adjacent portions of Illinois, is shipped by river to Evansville, Ind., and Henderson, Ky., for market in the southwestern coal-growing states. The coal-growing territory tributary to Evansville extends up the Ohio River for about 25 miles above Owensboro, Ky., and as far down as Paducah, Ky., up the Wabash for a distance of 40 or 50 miles and up to the lower portions of the Saline and Little Wabash rivers. The farmers haul the coal to the rivers, selling it to the river operators there and at several points along the rivers where mines are located, principally Uniontown and Henderson. From these points the coal is brought to Evansville and Henderson both by barges and packets, and whenever practicable shippers prefer to send it in tow to save shortage.

From Evansville and Henderson the coal goes south both by rail and river. Whenever there is sufficient water on the Tennessee River, the coal can be carried direct to Nashville for consumption at that point. Through rates to points in the southwestern states give this water rate to Nashville an advantage of several cents per hundred, and the factory receives more consumers as much as 2 cents per bushel. Thus water shipments must be made from Evansville and Henderson by rail.

TOTAL TRAFFIC ON THE OHIO

According to the reports of the Government engineers, the total traffic movement on the Ohio River for a period of years is represented by the following figures:

	Tons.		Tons.
1894	7,795,501	1900	14,054,322
1895	7,963,478	1902	12,202,017
1896	9,914,435	1903	12,499,842
1897	11,265,638	1904	10,142,551
1898	6,756,627	1905	13,163,656
1899	13,529,729	1906	11,427,784

These statistics are compiled from reports made by owners, agents, and masters of vessels and transportation companies, in compliance with act of Congress approved February 21, 1891. The detailed statistics for the year 1905 are presented in the following table:

TABLE II.—Commerce of Ohio River in 1911

[From United States Inland Waterways Report, 1909, pp. 1300, 1301]

Name of boat or company	Terminal points	Dis-tance	Ap-proxi-mate time	Freight			Passengers		
				Upstream	Down stream	Total	Up stream	Down stream	Total
		Miles.	Months.	Tons.	Tons.	Tons.			
The Monongahela River Consolidated Coal and Coke Company	Pittsburg to Cairo	981.0	1.0	3,165	1,101,512	1,104,677			
Do	Pittsburg to Louisville	606.0			190,101	190,101			
Do	Pittsburg to Cincinnati	403.0			209,931	209,931			
C. Little & Co.	Pittsburg to Cairo	981.0	1.0		130,000	130,000			
Sheffield Kirk Contract Co.	Pittsburg to Paducah	1,031.0	1.0	7,000	15,000	22,000			
West Kentucky Coal Co.	do	1,031.0	1.0	200,000	130,000	330,000			
Steamer Frank Tyler	Pittsburg to Louisville	606.0	1.0	10,000	10,000	20,000		1,000	1,000
Pittsburg and Cincinnati Packet Line	Pittsburg to Cincinnati	403.0	1.0	34,170	30,170	70,340	14,450	10,018	24,468
Cincinnati, Louisville and Charleston Packet Co.	do	403.0	1.0	83,300	93,300	176,600	33,013	37,070	70,083
Clyde Coal Co.	do	403.0	1.0		32,833	32,833			
Steamer Frank Gilmore	do	403.0	1.0		21,000	21,000			
Steamer Helen Willis	do	403.0	1.0		113,470	113,470			
B. F. Nelson	do	403.0	1.0	4,370	31,300	35,670	1,500	1,500	3,000
Steamer W. C. Little	do	403.0	1.0		11,000	11,000			
Steamer Darling	Pittsburg to Point Pleasant	304.0	2.0	10,340	4,000	34,340			
Steamer Kanawha	do	304.0	1.0	8,850	6,400	15,350	5,500	4,000	10,500
Steamer Ben Hur	Pittsburg to Parkersburg	194.0	0.5	0,000	9,000	9,000	0,000	4,000	10,000
Steamer Lyon	Pittsburg to Point Pleasant	170.0	0.5	1,000	0,000	0,000			
Steamer Corona	Pittsburg to Marietta	171.0	0.5	4,000	4,000	8,000	7,000	9,000	16,000
Diamond Coal and Coke Co.	Pittsburg to Bellaire	114.0	1.0		57,000	57,000			
Steamer The Leader	Pittsburg to Brilliant	74.0	1.0		464,250	464,250			
Steamer Lucille	Pittsburg to Toronto	50.0				0			50
John L. Klein	Pittsburg to Rochester	35.0	0.5						151,000
Sharpsburg Sand Co.	Pittsburg to Freeport	34.0	1.0	44,000	102,000	146,000			
Steamer Francis J. Torrance	Pittsburg to Newkirk	11.0							3,000
Steamer Harmony	Pittsburg to Glenfield	9.0	1.0	100,863		100,863			
Steamer Short Line	Pittsburg to Allegheny	1.0	1.0			50,000			70,000
Steamer Fred Gibson	Allegheny to Bellevue	4.0	1.0	1,000	1,000	2,000	100,000	100,000	131,000
Steamer Corona	Wellsville to Congo	1.0	0.0			1,000			19,000
Toronto Ferry Co.	Toronto to Sallo	1.0	0.0						19,122
Wise Bay	Steubenville to Portsmouth	94.0	1.0	8,037	7,000	10,000	83,000	85,007	108,437
Steamer Buckeye	Steubenville to Stebensville	70.0	1.0	30,000	3,000	34,000			31,000
Steamer Pirate	Steubenville to Wheeling	33.0	0.0	130	13	133	900	900	401
Steamer Nathaniel	Steubenville to opposite shore	1.0	0.0						1,000
Steamer West End	Wellsburg to Brilliant	1.0	0.0			000			20,000
B. V. Thomas	Log mills to Belmont	0.0	0.0	105,473		105,473			

a Includes movement to and from points on the Mississippi.

TABLE 9—*Commerce of Ohio River in 1905*—Continued

Name of boat or company.	Terminal points.	Distance.	In commission.	Freight. Upstream.	Freight. Down stream.	Freight. Total.	Passenger. Upstream.	Passenger. Down stream.	Passenger. Total.
		Miles.	*Months.*	*Tons.*	*Tons.*	*Tons.*			
Steamer Bessie Smith	Wheeling to Parkersburg	94.0	10.0			9,127			4,773
Steamer H. K. Bedford	do	94.0	9.7	3,380	4,290	7,670	7,508	10,108	17,616
Steamer Shifter	do	94.0				250			
W. J. Duffy	do	94.0	5.0	35,000	280,000	315,000			
Steamer Beaver	do	94.0	9.0	2,000	9,000	11,000	4,000	3,000	7,000
Steamer Jewel	Wheeling to Newport	66.0	9.0	7,000	3,000	10,000	6,000	6,519	12,519
Steamer Royal	Wheeling to Clarington	27.5	9.5	12,825	4,275	17,100	11,182	5,590	16,772
Steamer Catherine	Wheeling to Bellaire	4.0			30,675	30,675			
Steamer Charon	Bellaire to Benwood	1.0	12.0						264,532
Steamer Leroy	Sistersville to Marietta	34.0	10.0	4,880	600	5,480	9,817	11,480	21,297
Steamer Orion	Sistersville to Tewls Landing	1.0	10.5			18,000			14,600
Steamer Grace Virginia	New Matamoras to Hays Station	1.0	8.0			15,000			34,000
Steamer Melia A	New Matamoras to Matamoras	1.0	2.0			100			250
Steamer Valley Belle	Marietta to Middleport	80.0	10.0	10,422	6,179	16,601	2,875	3,547	6,422
Steamer Pioneer City	Marietta to Parkersburg	13.0	10.0	1,100	1,650	2,750	500	750	1,250
E. B. Suiter	Parkersburg to Louisville	414.0	7.0	4,910	29,710	34,620	570	740	1,310
Steamer Mountain State	Parkersburg to Carrollton	357.0	4.0	21,500	19,000	40,500			
Steamer Rayman	Parkersburg to Hockingport	14.5	10.0	500	100	600	2,000	1,950	3,950
Steamer Nina Paden	Parkersburg to Belpre	1.0	11.0			45,000			198,200
Steamer W. O. Hughart	Racine to Graham Station	1.0	9.0						8,550
B. J. Riggs	Syracuse to Addyston	238.0	9.0	400	43,105	43,505			
Steamer Klondike	Syracuse to Gallipolis	24.5	10.0	450	23,000	23,450	3,465	4,228	7,693
John Barrett & Son	Pomeroy to Cairo	715.5	10.0	19,300	34,150	53,450			
New Haven Towboat Co	Pomeroy to Henderson	545.0	6.0	86,960	73,040	160,000			
Thomas J. Hall	Pomeroy to New Albany	354.0	12.0	25,000	150,000	175,000			
Steamer Convoy	Pomeroy to Louisville	349.0		4,550	84,500	89,050			
E. J. Hickey Transportation Co	do	349.0	11.0		228,436	228,436			
Steamer Gondola	Pomeroy to Gallipolis	19.5	4.2	427	618	1,045	64	76	140
Steamer Champion No. 3	Pomeroy to Mason City	1.0							50,000
Steamer Little Ben	Middleport to Clifton	1.0	10.0						22,425
The Campbell's Creek Coal Co	Point Pleasant to Louisville	334.0	11.0		282,225	282,225			
Steamer Otto Marmet	do	334.0	12.0	13,754	143,156	156,910			
The Collins & Hartweg Co	Point Pleasant to Madison	289.5	10.0		222,870	222,870			
Marmet Coal Co	Point Pleasant to Cincinnati	204.0	12.0		206,624	206,624			
Steamer Winifrede	do	204.0	8.0		111,500	111,500			
Steamer Carrie Brown	Gallipolis to Huntington	39.0	12.0	3,260	6,260	9,520	9,475	14,521	23,996
Steamer Chevalier	do	39.0	10.0			6,000			16,000
Steamer Francis	Gallipolis to Steinbergen Landing	1.0	12.0			6,000			21,479
Steamer Arion	Proctorville to Guyandotte	1.0	11.0			36,000			78,600
C. Crane & Co	Guyandotte River to Cincinnati	164.0	8.0		440,000	440,000			
Steamer Sea Lion	Huntington to Louisville	290.0	10.0	9,200	77,560	86,760			
Steamer Leni Leoti	Huntington to Cincinnati	160.0	3.0	15,000	47,000	62,000			

Steamer Dunbar	Huntington to Ashland	14 0	13 0	300	300	300			
Steamer City of Huntington	Huntington to Richmond	1 0	13 0						30 000
Steamer Telephone	Catlettsburg to Boone	100 0		34 000	20 000	104 000	10 000	8 000	10 000
Steamer Bonita	Catlettsburg to South Point	1 0	1 0			300			3 000
Steamer Bob Ballard	Ashland to Trenton	3 0	11 0			400 000			
Steamer Wenona	Ashland to Coal Grove	1 0	13 0						314 000
Steamer Trenton	Trenton to Russell	1 0	13 0			30 000			130 000
Steamer Chess	Portsmouth to Boone	3 0	1 0	70	300	300	1 000	1 000	3 130
Steamer Day Patch	do	3 0	3 0	43	100	300	900	100	1 000
Steamer Emily	Portsmouth to Fulbeton	3 0	13 0			2 000			40 000
Steamer Chieftain	Portsmouth to South Portsmouth	1 0	13 0			10 000			100 000
Steamer W. H. Whitman	Manchester to South Manchester	1 0	10 0			9 000			30,000
Steamer Preston B. Smith	Higby to South Higby	1 0	10 0			4 000			30,000
Steamer Athens May	Hippitsport to opposite shore	1 0	7 0			100			3,000
Steamer Whitney	Augusta to Dover	1 0	10 0						9 000
Steamer Silver Star	New Richmond to Aurora	40 0	11 0				300	300	400
Steamer New Richmond	New Richmond to South New Richmond	1 0	9 0			9 000			14 000
Coney Island Co	New Richmond to Cincinnati	300 0	1 0	100	300	3,000	30,000	10,000	30,000
The	Coney Island to Cincinnati	9 0	7 0	800	300	1 000	300,000	300,000	870,000
Smith Sand Co	Dayton to Addyston	1 0	10 0		300,000	300,000			
Steamer Charlotte Bowles	Cincinnati to Cutler	60 0	11 0	30,000		30,000			
Lee Line	do	400 0	9 0	4,000	11,000	10,000	4,000	4,000	8,000
Steamer Nellie Willett	do	400 0	10 0	30,000	10,000	40,000			
Steamer Martha H. Hanna	Cincinnati to Paducah	150 0	8 0	13,000		13,000			
Burnside and Burkeville Transporta tion Co	Cincinnati to Smithland	400 0	9 0	300		300			
Steamer E. P. Miller	Cincinnati to Evansville	300 0	13 0	80,000	130,000	100,000			
Steamer Avalon	Cincinnati to Louisville	120 0	8 0	9,000	3,000	9,000	3,000	3,000	8,000
Steamer Blue Wing	do	120 0	11 0	9,000	30,000	39,000			
Louisville and Cincinnati Packet Co	do	120 0	10 0	100,000	20,000	120,000	70,000	30,000	120,000
Frank Miller	do	120 0	9 0		21,000	21,000			
Carl Werkman	Cincinnati to Madison	80 0	10 0	30,000	30,000	60,000	3,000	3,000	4,000
Steamer Boone No. 3	Cincinnati to Constance	7 0	10 0			34,000			10,000
Steamer Pauline	Lawrenceburg to Aurora	4 0	8 0	400	8,000	8,000	7,000	7,000	14,000
Steamer Swan	Aurora to Patriot	31 0	9 0	300	600	900	4,000	3,000	7,000
Steamer Eva Everett	Aurora to Grant	1 0	13 0			30,000			4,000
Steamer Hiawatha	Carrollton to Leavenworth	112 0	9 0						74,000
Louisville and Jeffersonville Ferry Co	do	112 0	8 0						100,000
Steamer Fall City	Carrollton to Louisville	8 0	9 0	10,000	30,000	30,000	2,000	2,000	9,000
Steamer Fanny	do	8 0		100	40	140			
Steamer White Dove	do	8 0	10 0	1,000	2,000	3,000	1,000	1,000	3,000
Steamer Raymond	Carrollton to Williams Landing	11 0	9 0	900	4,000	4,000			
Steamer Cecilia	Carrollton to Bethlehem	30 0	8 0	1,200	1,200	2,400			
Steamer John Mackey	Carrollton to Madison	14 0	8	1,000	900	3,000			
Steamer Columbia	Milton to Madison	1 0	13 0			30,000			30,000
Steamer Hanover	Madison to Bethlehem	14 0	10 0	800	200	1,000	3,000	3,000	4,000
Steamer William Dudley	Twelvemile Island to Louisville	13 0	9 0		104,000	104,000			
Louisville and Jeffersonville Ferry Co	Jeffersonville to Louisville	1 0	13 0						600,000
Steamer Alma	Louisville to Evansville	180 0	10 0	8,700	10,700	10,700			
Steamer Little Willie	do	180 0	10 0	9,000	12,000	12,000			
Louisville and Evansville Packet Co	do	180 0	10 0			120,000			16,000

* Includes movements to and from points on the Mississippi

TABLE 9—*Commerce of Ohio River in 1905*—Continued

Name of boat or company.	Terminal points.	Distance.	In commission.	Freight.			Passenger.		
				Upstream.	Down stream.	Total.	Up-stream.	Down stream.	Total.
		Miles.	*Months.*	*Tons.*	*Tons.*	*Tons.*			
Steamer Willie	Louisville to Leavenworth	60.0	6.0	500	100	600			
Steamer Little Archie	Brandenburg to Stephensport	55.0	7.0	160	240	400	50	110	160
Steamer Brownie	Chenaults to Tell City	31.0	5.0	36	245	281	2,250	1,800	4,050
Steamer Fawn	Cloverport to Henderson	89.0	5.0	5,045	1,444	6,489			
Steamer Nellie	Cannelton to Evansville	66.0		30		30			
Steamer Gazelle	Cannelton to Owensboro	32.0	10.0	1,200	4,800	6,000	6,200	6,200	12,400
Steamer Major	Cannelton to Hawesville	1.0	11.0			1,980			3,600
Steamer Eclipse	Tell City to Evansville	63.0	10.0	1,500	4,000	5,500			
Steamer Ondine	Rockport to Brookport	183.0	8.0	200	800	1,000			
Steamer Wabash	Owensboro to Paducah	171.0	8.0	18,485	1,750	20,235			
Robert Hornbrook	Owensboro to Shawneetown	99.0	8.0	161,616	42,824	204,440	5,082	5,082	10,164
John Archibald Coal Co	Owensboro to Mount Vernon	70.5	7.0	1,400	35,000	36,400			
Steamer Little Clyde	Mouth Green River to Joppa	161.0	10.0		260,300	260,300			
Steamer Neptune	Mouth Green River to mouth Cumberland River	133.0	10.0	1,100	35,000	36,100	10	10	20
Steamer Alice L. Barr	Mouth of Green River to Evansville	8.0			50,936	50,936	61		61
Evansville and Bowling Green Packet Co.	do	8.0	11.0	24,620	11,180	35,800	8,558	7,290	15,848
Steamer Edgar	do	8.0	8.5		30,000	30,000			
Steamer Francis	do	8.0	10.0		1,130,385	1,130,385			
Green River Mining, Manufacturing and Transportation Co.	do	8.0	9.0		37,500	37,500			
Steamer Kenois	do	8.0	1.0		750	750			
Steamer Old Reliable	do	8.0				22,500			
Charles McNutt	do	8.0	9.0			34,100			
P. H. Johnston	do	8.0	10.0	500	1,875	2,375	204	200	404
Steamer Sunbeam	do	8.0			48,072	48,072	3		3
Evansville, Paducah and Cairo Line	Evansville to Paducah	137.0	10.0	16,950	12,300	29,250	12,366	13,401	25,767
Steamer J. F. Buckham	do	137.0	7.0	12,000	16,000	28,000			
Ryman Line	Evansville to Smithland	125.0	5.5	3,200	4,500	7,700	764	892	1,656
Steamer Alfred B. Owen	Evansville to Shawneetown	65.0	10.0		10,000	10,000			
Steamer Jewel	Evansville to Henderson	11.0	10.0	5,000	20,000	25,000	21,750	25,470	47,220
Steamer Hearth	Henderson to Paducah	125.5	10.0		18,000	18,000			
Steamer Henderson	Henderson to Indiana shore	1.0	7.0			650			5,650
Steamer New Haven	Mount Vernon to Shawneetown	28.5	12.0	2,500	2,500	5,000			
Ayer & Lord Tie Co	Mouth Wabash River to Brookport	85.0	9.0		305,811	305,811			
John S. Summers	Shawneetown to Cairo	117.0	10.0	130	44,208	44,338			
Steamer Enos Taylor	Shawneetown to Metropolis	81.0	8.0	5,005	13,326	18,331			
Fairview Mining Co	Shawneetown to Brookport	75.0	12.0	5,000	17,790	22,790	99	102	201
Steamer Georgia	Shawneetown to Blackburn	1.0	12.0			500			7,300
Steamer Nellie Brown	Dekoven to Paducah	61.0	12.0		38,106	38,106			
Steamer Charles Turner	Mouth Tradewater River to Joppa	76.0			410,800	410,800			
Steamer Royal	Golconda to Paducah	30.0	9.0	2,115	1,410	3,525	5,878	7,398	13,276

DISTRIBUTION OF TRAFFIC

Besides packet lines and bulk carriers the traffic covered by the foregoing data includes local ferry lines and car ferries, and also the local transportation of sand and gravel, which should hardly be considered as part of the important long-distance water traffic. On the other hand, it is probable that it does not include some steamboat traffic on the Ohio below Louisville, which does not pass any Government improvement, nor the local traffic of gasoline boats. It is also clear that the above totals do not include the enormous local traffic on the Monongahela River which stops at Pittsburg. Including the latter, it seems probable that the total volume of traffic on the Ohio and Monongahela rivers is over 20,000,000 tons a year.

Mr. George H. Anderson, long connected with the Pittsburg Chamber of Commerce, estimates the gross traffic on the Ohio River at 25,000,000 tons annually. This is obviously an excessive figure for the strictly Ohio River trade, but is perhaps a fair estimate if intended to include also the local movement on the Monongahela River and other tributaries of the Ohio.

The distribution of this traffic at various points is indicated by the following table:[a]

	1905.		1905.
	Tons.		*Tons.*
Allegheny River	2,464,445	Davis Island Dam	3,247,753
Monongahela River	11,447,444	Great Kanawha River	1,613,899
Pittsburg Harbor	12,269,020	Louisville	1,436,674

Much of the traffic at each of the points in the above table is duplicated at one or more of the other points, so that an aggregate of these figures would be much in excess of the total traffic movement.

It will be noted that the greatest volume of traffic centers at Pittsburg, where the local tonnage of the Allegheny and Monongahela rivers is combined. The movement down the Ohio from Pittsburg is indicated by the tonnage at Davis Island Dam; and this is increased by the traffic out of the Great Kanawha River and other tributaries, and by local freight. The aggregate movement from Pittsburg and the Kanawha River is about 5,000,000 tons. But a large part of this stops at Cincinnati and Louisville, and the through traffic to the lower river is indicated by the tonnage of 1,436,674 at the latter point.

UPPER MISSISSIPPI RIVER TRAFFIC

The freight movement on the Mississippi falls under the twofold division of (1) traffic on the upper Mississippi; and (2) traffic on the lower Mississippi.

The traffic on the upper river is handled by the fleet of one through packet line from St. Paul to St. Louis, by several lines operating between intermediate points, and by other vessels owned by individuals.

[a] Compiled from U. S. Chief of Engineers Report for 1906.

PACKET LINES ON THE UPPER MISSISSIPPI

The Diamond Jo Line of steamers is one of the leading lines on the Mississippi and the only one connecting the termini between which this line runs, which are St. Louis and St. Paul, vessels stopping at Keokuk and Burlington, Iowa, and other intermediate points. The company was incorporated in 1903 under the laws of Missouri to succeed an Iowa corporation of the same name whose property was sold by special master's sale in 1903 at Carthage, Ill. Capital stock, $250,000. The fleet consists of four steamers engaged in carrying package freight north, with merchandise, grain, flour, and live stock south. The freight tonnage in recent years has varied from 25,000 to over 40,000 tons. The Diamond Jo Line owns several barges, a wharf boat at St. Louis, and warehouses at various river points.

The schedule received from this company by the Bureau of Corporations states that it is seldom that tramp steamers are ever encountered in the trade of this line.

The schedule also states:

Our aim is to make our freight rates less than the railroads. While we have no agreements with any railroad, we make our freight tariffs our based in a reduction of from 20 to 25 per cent less than the rail rates. For an account of frequent service of the railroads and quicker time by rail, and due to account of the cost to the shipper for marine insurance on shipments of freight, it is necessary to make considerably lower rates by river to secure a fair share of the business.

It is the custom with the railroads in our territory to make special or commodity rates on some particular class of shipments, especially at local points, and such articles may be manufactured or shipped by only one shipper at such local point. We have reason to believe that such rates were made only with the understanding that the railroad was to get all the business.

Referring to these commodity rates given by railroads, the general passenger and freight agent of the Diamond Jo Line, St. Louis, made the following statement to an agent of the Bureau of Corporations in the summer of 1907:

This custom exists along the river from Burlington to St. Louis. Such arrangements are in effect at Quincy, Ill., at which point the Burlington Railroad has made such rates on show cases, cereals, and other commodities. The rate is one that can be taken advantage of by all shippers, yet it results that, since there are only one or two factories at each point making such shipments, the benefit of the rate operates to their advantage. The Burlington is the direct road from these river points, and is the road that does the rate. On other roads meet the Burlington rates at such points where competition exists. An example of this is the Wabash at Quincy. This condition exists chiefly below Burlington. Above Burlington the season for the boat line is so short that the railroads do not find it necessary to adopt such methods.

On most classes of merchandise the rates of the Diamond Jo Line run 20 per cent below the rail rate between St. Louis and Keokuk, 25 per cent below between St. Louis and Nauvoo, Fort Madison and Burlington, Iowa, and 30 per cent less from St. Louis to all points north of Burlington, to and including St. Paul. Even at these rates the boats carry little freight. The reason for this is that the boats can not depend upon a navigable stage of water. In winter the river is closed up for several months, and in summer gets so low that it is exceedingly impossible to navigate the boats. With a good stage of water assured, the company would put in a different type of boat, especially adapted to the handling of freight, and a great deal of new business would be attracted to the river, because of the lower rates that could be made.

Formerly the Diamond Jo Line enjoyed a considerable trade in flour from the Minneapolis mills. On this business the boat line paid the railroad mileage from Minneapolis to St. Paul and a wagon transfer charge in St. Paul, and yet competed with the railroad to St. Louis. There was so much trouble with low water however that the business has gone to the railroads. The millers would sell the flour delivered in St. Louis, basing the price on the steamboat freight rate. Then the river would fall and the contract would have to be filled by rail shipment, entailing a loss if the difference between the boat rate and the rail rate.

Under present conditions the Diamond Jo Line will not contract to handle heavy shipments of this kind, and the only contract they make is one from trip to trip. It could handle export flour routed via New Orleans, but it can not guarantee any connection below St. Louis, there being no through lines to New Orleans at the present time.

The boat line has brought as many as 5,000 barrels of flour from St. Paul in a single cargo, being flour consigned to New Orleans, but for the reason stated the line can no longer handle this business.

Under the present river conditions the mills and factories are locating on tracks farther and farther back from the river, and drayage on carload lots is getting to be more and more of a factor that operates against the boats.

The traffic of the Diamond Jo Line is a passenger traffic almost altogether. What freight business is done is mostly a general merchandise business between St. Louis and St. Paul. No grain now comes to St. Louis from the upper Mississippi.

In addition to the Diamond Jo Line, several small packet lines operate on the upper Mississippi. Among these are the Carnival City Packet Company, between Davenport and Burlington, Iowa, and between Keokuk, Iowa, and Quincy, Ill.; the Eclipse Company, between Lyons and Leclaire, Iowa; the New St. Louis and Calhoun Packet Company, between St. Louis and points in Calhoun County, Ill.; and the Eagle Packet Company, from St. Louis to points on the Mississippi and Illinois rivers as far as Peoria, Ill.

KANSAS CITY LINE

A new boat line has recently been established on the Missouri River between St. Louis and Kansas City. A former line which was in operation between the same points some twelve or fifteen years ago went out of business after the reduction of rail rates. The physical difficulty with which the new line has to contend is that the boats are not of a type adapted to the Missouri River service, being small carriers with a capacity of about 300 tons each. It is thought that the two boats are not heavy enough for the currents of the Missouri River, which require larger boats, strongly built, and powerful engines. The rates of this new Kansas City line are (August, 1907) considerably lower than by rail, the railroads having not yet met these rates.

TRAFFIC ON THE LOWER MISSISSIPPI

This section of the river, because of the freight tonnage it receives from the Ohio, Cumberland, Tennessee, Arkansas, and numerous streams farther south, has always been recognized as of greater commercial importance than the upper reach. This relative importance it still retains. For causes more fully described in subsequent portions of this Appendix, however, traffic movement on the lower Mississippi has so materially declined in recent years that the supremacy once enjoyed by the Mississippi River has been transferred to the Ohio. Few realize that Pittsburg, rather than either St. Louis or New Orleans, is to-day the most important river point in America. The shifting ascendancy of rivers and ports marks still wider changes in the agricultural and industrial life of the Middle West and Southwest. Among other things it signalizes on the one hand a railroad expansion in a territory to which improved means of communication have hitherto been undeveloped, and on the other the adaptation in one of the most advanced industrial districts in the world of a very old form of transportation to the requirements of a new age. A packet boat on the Mississippi and a steel barge on the Ohio reflect two entirely different stages of American economic progress.

PACKET LINES ON THE LOWER MISSISSIPPI

As contrasted with the single important packet line on the upper Mississippi—the Diamond Jo Line—there are to-day about a dozen more or less important packet lines on the lower section, not to mention individual steamers and some gasoline boats. Some of the packet lines use the Mississippi only for the purpose of reaching points on tributary streams, but some of them send their vessels from St. Louis or the Ohio River through to New Orleans. Here and there, moreover, may be found evidences of a division of territory between the regular packet lines, although, so far, there is no positive proof of any such understanding.

While there are no longer any through lines of packets between St. Louis and New Orleans, there is still a considerable interchange of merchandise between towns like St. Louis, Memphis, Vicksburg, Natchez, and lower river ports, as well as points on the Arkansas and other streams, which furnish cotton, cotton seed, and other plantation products in return for plantation supplies. Packet lines, moreover, running between St. Louis and various points on the Ohio, Tennessee, and Cumberland rivers—lines, for example, like the Lee Line Ohio River division and the St. Louis and Tennessee River Packet Line—appear to prosper.

The following is a list of the more important packet lines on the lower Mississippi, together with some account of their organization and operation:

1. Lee Line steamers: Unincorporated; fleet composed of 8 steamboats, operated over the following divisions: Cincinnati and Memphis division, St. Louis and Memphis division, Cairo and Memphis division, Memphis and Ashport (Tenn.) division, Memphis and Friars Point (Miss.) division. The vessels carry miscellaneous freight.

2. St. Louis and Tennessee River Packet Company: Operating from St. Louis via the Ohio River to points on the Tennessee River.

3. Eagle Packet Company: Incorporated under the laws of Missouri, 1903; capital stock, $150,000; operates 4 steamers between St. Louis and Cape Girardeau and Commerce, Mo., in addition to the upriver lines noted above. Merchandise outbound; live stock and farm products inbound.

4. Arkansas River Packet Company: Incorporated under the laws of Tennessee; capital stock, $150,000; fleet of 4 steamers operating between Memphis and Vicksburg and Little Rock. From Memphis the boats carry general merchandise and plantation supplies, with return cargoes of cotton and cotton seed. This line has recently completed arrangements with the Monongahela River Consolidated Coal and Coke Company whereby cotton brought to Memphis by the packet line will hereafter be taken to New Orleans in towed barges of the latter company and delivered alongside ocean-going steamships bound for Liverpool, Havre, etc., at 50 cents per hundred, including an allowance for insurance. The rail rate for the same haul is 92 cents. The Arkansas River Packet Company uses the Southern Freight Classification on the east side of the Mississippi, and the Western Classification on the opposite side, to rail competitive points.

This company states that the line has given up operating with railroads for the reason that "the railroads, after taking shipments of

cotton for the East and for the export trade, would cause delivery to be delayed after they had loaded the cars from the boat lines and would hurry their own shipments. Boat line had to pay same rate as other local shippers."

The Arkansas River Packet Company owns one-half the stock of the Consolidated Wharf Boat Company at Memphis, representing $10,000 (the other half being owned by the Memphis and Arkansas City Packet Company); and it also owns a warehouse at Pine Bluff and is building another at Little Rock.

5. Memphis and Arkansas City Packet Company: Incorporated 1889 under the laws of Arkansas; capital stock, $100,000; operates 1 steamboat between Memphis and Arkansas City, carrying general merchandise, cotton, and cotton seed.

The only other boat line running between the same terminals is the Memphis and Vicksburg Packet Line; railroad competitors, Illinois Central (Yazoo and Mississippi Valley) and Missouri Pacific.

6. Vicksburg and Greenville Packet Company: Incorporated 1886 under the laws of Mississippi; capital stock, $65,000. Owns 1 steamer in the Vicksburg and Greenville trade, chartered to the Arkansas River Packet Company, which has an option on same.

7. Natchez and Bayou Sara Packet Company: Partnership, operating a small packet boat between points indicated, stopping at intermediate plantation landings. Boat carries miscellaneous freight, plantation supplies, cotton, and cotton seed. Rates between Louisiana points are required to be filed and approved by the Louisiana State railroad commission.

This boat runs in competition with New Orleans and Vicksburg boats and Yazoo and Mississippi Valley Railroad; also with tramp steamers, the effect of which is to make shippers dissatisfied in dull seasons.

8. Mississippi Packet Company: Incorporated 1892 under the laws of Mississippi; capital stock, $50,000. Owns 3 stern-wheel steamboats, one of which is operated by the Natchez Transportation Company, New Orleans. Vessels ply between New Orleans and False River, La., carrying general merchandise, sugar, molasses, cotton, and cotton seed. All transportation companies prorate on freights forwarded by this company's boats. Two boats only operate three or four months in the year.

9. Lyon Packet Company: Partnership; operates 2 passenger and freight steamboats between Greenville, Miss., and Luna and Sunny Side, Ark., carrying cotton and plantation supplies.

10. Natchez Transportation Company: Incorporated in Mississippi in 1902. Capital stock, $40,000. Owns 1 steamer but operated in 1905 another steamer, owned by the Mississippi Packet Company. Operates from New Orleans to Harwood, Ark., and has a regular tariff authorized by the Louisiana State railroad commission.

11. Ouachita Transportation Company: Organized under the laws of Illinois in 1898. Capital stock, $35,000. Owns and operates 1 steamer from New Orleans to the Bends above Vicksburg. The steamer of the Natchez Transportation Company runs in the same trade, and in the slack months the boats of the two companies run in alternate months; in the cotton season both boats are operated on different days. Traffic consists of merchandise and plantation

supplies north; and cotton, cotton seed, rice, sugar and molasses south.

Among other lines may be mentioned: The Planters' Packet Company, operating between Memphis and O. K., Miss.; and from New Orleans the Baton Rouge and Atchafalaya Packet Company to Melville, La., and the Packet Line to Monroe, La., on the Ouachita River.

ASSOCIATIONS OF MISSISSIPPI RIVER PACKET LINES

At St. Louis there is an organization known as the St. Louis Steamboat Managers' Association, John E. Massengale, chairman. It is an informal organization for mutual protection, one of the results achieved being the abolition of wharfage charges against steamboats at St. Louis. John E. Massengale, chairman, is traffic manager of the St. Louis and Tennessee River Packet Company, affiliated with the Louisville and Nashville Railroad; J. W. Finnie, another member of the executive committee, was formerly president of the St. Louis-Chester-Cape Girardeau Line; Henry Lettie, an also of the executive committee, is president of the Eagle Packet Company, and W. K. Kavanaugh, of the executive committee, is president of the Wiggins Ferry Company, the stock of which is controlled by an association of railroads centering in St. Louis.

From a statement made to a representative of the Bureau of Corporations by an official of one of the boat lines in this association, it seems clear that there is an understanding among the members that none of them shall aid or assist wharf facilities to any new boat line that may enter into competition with any other member. The effectiveness of this agreement to shut out new lines will be appreciated when it is understood that the members control, directly or indirectly, the greater part of the river front most available for landing purposes at St. Louis.

There is also a Steamboats Traffic Association at New Orleans which makes rates for the boat lines on interstate commerce, which are filed with the State railroad commission for approval.

BULK FREIGHT ON THE LOWER MISSISSIPPI

Of bulk freight on the lower Mississippi, coal from the Ohio River constitutes the main factor. There is some movement of lumber up river and on the tributaries. Grain is now of very small importance.

GRAIN

No grain is shipped out of St. Louis by river to any considerable extent, the export business by this route being entirely dead. For many years the St. Louis and Mississippi Valley Transportation Company, which was primarily organized by Grain interests, successfully engaged in the grain trade between St. Louis and New Orleans, but has been out of business for several years. The craft of this company were of wood, many of them over 25 years old, not built according to modern rules, and it cost at least 25 per cent per annum to keep them in condition, besides the high insurance rate on the cargo. As a consequence the craft of the line were sold, most of the barges being bought by the Monongahela River Con-

solidated Coal and Coke Company. The St. Louis Steel Barge Company was organized for this same grain trade; but on account of no grain business offering, this company has gone into the business of transporting oil in bulk.

Formerly large quantities of wheat, corn, and oats were sent by river from St. Louis to New Orleans for export, but the building of railroads through Nebraska, Kansas, Oklahoma, and Indian Territory to the Gulf, together with the lack of attention given to river improvement, have operated against St. Louis as a point of shipment for river grain. The last of the river shipments taken by the St. Louis Steel Barge Company was in 1902; and the St. Louis and Mississippi Valley Transportation Company went out of business shortly afterwards. During the past six or seven years several elevators, formerly used for storing export grain at St. Louis, have been dismantled or destroyed.

When the Anchor Line of steamers was running many shipments of grain were made from Cairo, being drawn from all over Illinois. Shipments of oats were particularly large. With the building of railroad connections from Cairo into southern territory, the boat lines lost the business, the railroads making rates low enough to get the trade. At one time the rate from the point of shipment in Illinois to Mississippi River competitive points, to and including New Orleans, was 20 cents per 100 pound. The carrier north of the Ohio took 12 cents of the rate, leaving 8 cents to the carrier south of the Ohio. This 8-cent rate was ruinous to the boat line, since out of this had to be taken the cost of rehandling and insurance. The railroads also allowed the bulk grain to be stopped in transit and sacked, at the same rate of freight. Subsequently the railroads put in switches on the larger plantations for delivery of the railroad freight. Finally most of the grain grew on the railroad line back from the river, thus putting the boat lines at a further disadvantage. Another difference in the matter of shipping is the cost of loading and unloading. On rail shipments the shipper stands this expense, while on river shipments the loading and unloading costs are borne by the boat line. As a result of these conditions Cairo is no longer a point for grain shipments by river.

Lumber

Cairo is an important point for the receipt of logs and lumber from the lower Mississippi and for railroad ties from the Cumberland, Tennessee, Mississippi and other streams. Companies engaged in this trade are:

Monongahela River Consolidated Coal and Coke Company, and its affiliated concern, the Huntington and St. Louis Towboat Company, of Cairo.

Barrett Line, Oscar Barrett owner, Cincinnati, operating 4 steamers and 21 barges.

Fred Bennett, Cairo, Ill., 1 steamer and fleet of barges doing a job business about Cairo.

Cairo, Memphis & Southern R. R. and Transportation Company, the river department of the Chicago Mill and Lumber Company, Chicago, Ill. This company operates 1 steamer and 10 barges between Cairo and Arkansas City, Ark., handling logs exclusively for the Chicago Mill and Lumber Company.

The logs and lumber brought in by these companies are reshipped at Cairo over the Big Four and Illinois Central to Chicago and points north and east. There has been much complaint among shippers regarding the inability of the railroads at Cairo to furnish cars in sufficient numbers.

Considerable pulp wood is brought to Cairo by the steamer and nine barges operated by the Interstate Transportation Company, V. C. Wilson, manager, Hickman, Ky., for paper mills at Dayton, Ohio. This pulp wood is brought to Cairo after being picked up at points on the Mississippi.

Ayer-Lord Tie Company, Chicago, Ill., owning the Ayer-Lord Barge Company, is said to be the largest concern of its kind in the world. They operate a fleet of 6 or 7 steamers and a number of barges on the Tennessee, Cumberland, and Mississippi rivers, but do not ship from Cairo.

The most important log and lumber towing concern at Memphis is the Parson-Tully Transportation Company, which was formed in 1906 by a consolidation of the Memphis Towing, Barge and Derrick Company and the Bluff City Towing Company. The greater part of the stock of the Parson-Tully Transportation Company is owned by the Anderson-Tully Lumber Company of Memphis; but the transportation company tows for all the mills of Memphis, among which are the Bennett Harrwood Lumber Company, Moore & McFarlin, and the James Thompson Lumber Company. The Wolf River Towing Company, of Memphis, is another concern engaged in the log and lumber towing business at Memphis.

Many lumber mills on the tributaries of the lower Mississippi operate towboats, handling rafts of logs and barges of lumber.

Coal

The principal coal operator on the lower Mississippi is the Monongahela River Consolidated Coal and Coke Company. As far as can be learned, all the coal this concern takes to St. Louis by river is shipped to the Laclede Gaslight Company. Towing for the Monongahela River Consolidated Coal and Coke Company at St. Louis is done by the Consolidated Coal Company, which is a Gould property. There is no other coal brought to St. Louis by river. Coal for domestic and steam purposes is taken there from the southern Illinois fields by railroad.

River coal coming to Memphis is not only used locally but is also shipped over the various railroads to points in the neighboring territory as far as Jackson, Tenn., Jackson, Miss., Little Rock and Hot Springs, Ark., and Springfield, Mo. At these different points the Pittsburg river coal competes with coal brought by railroad from other coal fields. East of the Mississippi this rail coal comes from southern Illinois, western and southeastern Kentucky, eastern Tennessee and northern Alabama. West of the Mississippi the competing rail coal comes from mines at Russellville, Ark., and in eastern Oklahoma. The Pittsburg coal, however, has a distinct advantage for gas-making purposes.

A coal tipple for loading river craft at Greenville, Miss., was built about 1906 by the Southern Railway for the purpose of loading Alabama coal on river craft for transportation to New Orleans and lower river territory. For about two years the river transportation

was performed by the Ella Layman Transportation Company, of Charleston, W. Va., under agreement with the Southern Railway, but the transportation company gave up the business, and five or six years ago the railroad, which had been operating its own fleet for several years, abandoned the attempt, selling its boats and barges to the Monongahela River Consolidated Coal and Coke Company, which ran the fleet for a year or two. After a few years cessation of business at this point, the latter company is again transporting coal from Greenville.

From such points as Vicksburg, Natchez, Baton Rouge, and Donaldsonville, river coal is delivered in the "original" coal boats at plantations and sugar and rice mills. A fleet of coal boats is left at the "harbor" of one of these delivery points and sent out from there as needed. The coal trade in the Teche country, in southern Louisiana west of the Mississippi, has been seriously impaired in the last few years by the competition of Texas oil.

New Orleans is much the most important point for river coal traffic on the Mississippi. River coal is handled here for supplying ocean and river steamers, for the Texas and Pacific and Southern Pacific railroads, for local consumption and for delivery to plantations and sugar and rice mills in the neighboring territory west of the Mississippi. The bunker trade for ocean steamships forms the largest part of the traffic. The steamship bunkers are loaded directly from the coal boats in which the coal has been brought from Pittsburg. This is more convenient and takes less time than to load from railroad cars on the wharf, or to have the steamship go to a coal elevator to bunker. River coal is also shipped by sea for consumption at Mexican and Central American ports. The coal for locomotive fuel on the railroads is also a very large item in the traffic, and from 40,000 to 50,000 tons a year goes out on the railroads to the plantation trade. Most of this river coal trade at New Orleans is handled by the Monongahela River Consolidated Coal and Coke Company, either directly or through subsidiary companies.

There is also some trade in anthracite coal at New Orleans, brought by schooners from Philadelphia and New York. Coal from Alabama, Kentucky, and Illinois mines comes by rail to New Orleans, and finds a market in the local steam trade and the neighboring territory east of the Mississippi River. For the country west of the river, the transfer charges on rail coal give the river coal an advantage.

Bulk Carriers at New Orleans

Several companies are engaged in bulk traffic in the district around New Orleans, principally in petroleum oil and cotton seed.

The St. Louis Steel Barge Company handles fuel oil in bulk, which is delivered at plantations and landings on the Mississippi River between New Orleans and Baton Rouge. The company was incorporated in 1900 under the laws of Missouri, with a capital stock of $100,000, and operates one towboat and one steel barge. In 1904 it carried 338,158 barrels of oil; in 1905, 265,686 barrels.

The Louisiana Petroleum Company carries its own oil, received from a pipe line running from Jennings to Plaquemine, La., and delivers along the Mississippi River, between Memphis and New Orleans, and on Bayou La Fourche. The company was incorpora-

1902 under the laws of Louisiana, with an authorized capital stock of $[illegible], of which $121,[illegible] has been issued. It has three tugs and six barges.

The Mississippi Transportation Company was organized in 1902 under the laws of Louisiana, with an authorized capital stock of $[illegible], of which $[illegible] is issued. It purchased the equipment of the Gulfport Interstate Transportation Company, and has two boats and nine barges, which operate on the Mississippi River between New Orleans and Greenville, and also on the Atchafalaya and on Red River. This company handles principally cotton seed, but also coal, lumber, logs and ties, and does some job towing. It began operations in December, 1906.

TOTAL FREIGHT TONNAGE ON THE MISSISSIPPI

It is impossible to obtain accurate statistics of the freight traffic on the Mississippi as a whole. The Des Moines Rapids Canal at Keokuk does not fully measure the traffic on the upper section, and there are no measurements on the lower section where the engineers secure systematic reports of commerce. Arrangements have been made by local bodies to gather these statistics, but the results are so unsatisfactory that the total traffic can only be guessed at. Some place the total Mississippi traffic at [illegible] tons. That this is an exaggeration, however, is very plain. The engineers' reports, containing statistics of various sections of the river, give us a total traffic in 1908 of only [illegible] tons, of which [illegible] tons represented traffic on the upper Mississippi, and [illegible] tons traffic on the lower Mississippi, and even these figures duplicate traffic moving from one section to another. Detailed statistics are given in the foregoing tables of navigable streams. The United States census reports the total freight on all the rivers of the Mississippi Valley including the Ohio and its tributaries in 1906 at [illegible] net tons.

HISTORICAL REVIEW OF DECLINE OF TRAFFIC ON MISSISSIPPI RIVER

Steamboat transportation on the lower Mississippi from the fifties until the early eighties was the chief agency upon which the people of the Mississippi Valley depended for the carriage of freight and passengers. Through boat lines running from Cincinnati, Louisville, and St. Louis to New Orleans brought down the products of the upper rivers, returning with sugar, molasses, and other products from the lower river. The river was also the main artery of passenger traffic, and receipts from that source and from the carriage of the mail were great. One boat sold for the privilege for the lifetime of the boat for $[illegible], a sum that built the hull of the steamer. The river traffic was interrupted by the war but sprung up after its close. Besides the through lines to the northern cities, there was equally important trade from Memphis, Greenville, and Vicksburg to New Orleans, the carriage of cotton being of especial importance, as it was also to steamboats running up the Red, Arkansas, White, Oklahoma, Yazoo, and other streams.

From the fifties until the early eighties the river business enjoyed its greatest importance and many splendid steamboats were in the service.

One of the earlier lines was the Merchants Line, running from St. Louis to New Orleans. The fleet was not organized into a company, but represented a group of separately owned steamboats. The boats ceased operations many years ago.

Probably the most famous line that operated on the lower Mississippi was the Anchor Line, whose boats ran south from St. Louis. At its organization the boats of this line acquired the trade to Memphis, and finally extended operations to Vicksburg and subsequently to New Orleans. The building of railroads along the river diverted the passenger traffic and was a serious blow to the freight business. The owners of the Anchor Line were unable to cope with the railroads and let their boats run down. In 1895 the company sold out to a New York company, which had the backing of Austin Corbin & Co.

All the Anchor Line boats have now disappeared, except the *City of Providence*, which still runs at St. Louis as an excursion boat. At one time the line owned as many as 19 fine steamboats, operating from St. Louis to Memphis, Vicksburg, and New Orleans.

Much cotton formerly went to Vicksburg out of the Yazoo Valley. The Parisot Line of steamboats ran seven or eight boats in this trade, having three or four boats leaving each week. This line operated only to Vicksburg from up the Tallahatchie, Sunflower, and Yazoo rivers. Two or three of its boats were built for the through trade to New Orleans, but this service did not last long, the line finding it more profitable to ship to Vicksburg and there reload the cotton on boats to New Orleans. Some of the Parisot boats carried as many as 4,000 bales of "big" cotton, while most of them had a capacity of 1,000 to 2,000 bales in seasons of good water. When the water was low the steamers towed barges for lightering their loads over shoal places. This line was known as the "P" Line.

The competition of the Yazoo and Mississippi Valley Railroad put the Parisot Line out of business. The boat rate of $1 per bale from points on the Yazoo River to New Orleans was adopted by the railroad at points where river and rail met in competition. At points back from the river the rail rate was more. Even at the same freight rate from competitive points the railroad had the advantage in the matter of insurance. The Parisot Line was sold to the Yazoo and Tallahatchie Transportation Company about 1888. The latter company ran about ten years, finally succumbing to rail competition.

The Mulholland Line ran between Vicksburg and Greenville, operating one or two boats. The property of the line was owned by Capt. J. J. Powers, of Vicksburg, who, with Capt. A. F. Nimtz, formed a new company for the same service, calling it the Vicksburg and Greenville Packet Company, which is still in existence. Up to about a year or so ago this company encountered severe competition from the Arkansas River Packet Company, which put in a boat leaving on the same days as the *Belle of the Bends*, the boat of the Vicksburg and Greenville Packet Company. Finally an agreement was reached by which the Vicksburg and Greenville Packet Company still survives, but its steamboat the *Belle of the Bends* is operated by the Arkansas River Packet Company. The incorporators and stockholders of the two companies are distinct, but Captain Nimtz has become the representative of the Arkansas River Packet Company at Vicksburg.

Another important company engaged in carrying cotton seed from the Bends above Vicksburg to New Orleans was the Interstate Transportation Company, owning five or six towboats and some thirty or forty barges. This company was in its prime in the eighties, but went out of existence twelve or fifteen years ago.

One of the most famous lines that operated on the Mississippi in former days was composed of boats running to New Orleans from Vicksburg and Greenville, two a week from Vicksburg and one from Greenville. These were the *Robert E. Lee*, *J. M. White*, *Natchez*, *Frank Pargoud*, and the *Katie*. They were separately owned, but were generally run in harmony by agreement, leaving on different days. They were never organized as one company, nor were they under common ownership, but for a certain period the earnings were divided, one pool lasting for five years. These boats were known as the Vicksburg and New Orleans packets and the Greenville and New Orleans packets. They disappeared gradually, the end coming about fifteen years ago, as a result of the sharp railroad competition.

There were a first and a second *Robert E. Lee* on the river, and also a first and second *Natchez*. The first *Lee* was built in 1866 and the first *Natchez* in 1869. It was between these two boats that the famous race from New Orleans to St. Louis took place in 1870. The boats left New Orleans June 30, the *Lee* arriving at St. Louis at 11.30 a. m. July 4, the *Natchez* arriving later.

Boats on the Mississippi have not changed in type from those of the early days. The substitution of steel for wooden hulls has been about the only change, and the use of steel hulls is not general. Only one boat now running to Vicksburg is so built. This boat is the *S. S. Brown* of the Arkansas River Packet Company. She is a new boat. Another steel-hull boat, the *Fred Harold*, now owned by the Lee Line, at Memphis, and operated by it between Memphis and St. Louis, made a few irregular trips to Vicksburg some ten years ago.

The opening in 1883 of the Louisville, New Orleans and Texas Railroad, now known as the Yazoo and Mississippi Valley Railroad, an Illinois Central property, went far toward accomplishing the downfall of steamboat traffic on the lower Mississippi. The railroad paralleled the river from Memphis to New Orleans, reaching all the important towns on the east bank of the river. Prior to the opening of the railroad cotton from this territory had been sent to New Orleans by river at $1 to $1.50 per bale, but on the completion of the railroad the rail rate soon reached a point where it was unprofitable for the boats to handle cotton. From river competitive points such as Vicksburg the rail rate dropped as low as 45 or 50 cents per bale to New Orleans, while from points back from the river such as Rolling Fork, Miss., about 40 miles from Vicksburg and 10 from the river, the railroad required freight charging $1 to $2 per bale.

The matter of insurance also operated against the river route. The railroad rates, as given above, included the common carrier's liability of risk, but on all cotton shipped by boat the shipper was put to an additional expense of from one-half of 1 per cent to 1 per cent of the value of the shipment. The premium on shipments from Vicksburg to New Orleans amounted to 25 cents on a bale of cotton valued at $50.

In the early eighties and before, there were lines of cotton boats running to New Orleans from Memphis, Greenville, and Vicksburg, built especially to carry cotton. One of them, the *Henry Frank*, carried the record cargo of 9,226 bales, of which three-fourths were big or uncompressed bales. This cargo was carried to New Orleans in 1881.

With the spread of cotton compresses throughout the South the conditions under which cotton is transported altogether changed. Formerly the only compresses were located at important centers, such as Memphis, Vicksburg, and New Orleans. Nowadays any town of comparatively slight importance has its own compress. Practically all these compresses have excellent facilities for receiving and shipping the bales by rail. The railroad track is at the door of the compress, and on cotton that has been brought to the compresses by the railroad a "refund" is allowed if the cotton is sent from the compress by rail. This has overturned the old system of handling cotton by river. The planter still sends his cotton to the commission merchant or factor to sell and the latter sells it to the cotton buyer who has the cotton compress. The buyer now ships the cotton directly from the compress on a through bill of lading to the New England mills, to Liverpool, Havre, or elsewhere. Export cotton is generally routed via New Orleans, and that for New England may go by one of several routes, a good part of the latter being handled by the Illinois Central via Louisville or Cincinnati. Much of this formerly went by river to Cairo or to Cincinnati, whence it was forwarded by rail to New England.

TERMINALS AND THEIR CONTROL

In the treatment of this subject only so much of it as refers to terminals on the Ohio and Mississippi rivers and their immediate tributaries is considered. The wider aspects of the subject of port terminal facilities, including the ownership and administration of docks and wharves on the Great Lakes and on the Atlantic and Pacific seaboards, although in a measure relating to commerce on tidal streams, has in this connection been omitted.

In this portion of the present appendix the Ohio River terminals are first considered, followed by a consideration of Mississippi River terminals.

WHARFAGE AND AGENCY CHARGES ON THE OHIO

Most of the river landings on the Ohio and its immediate tributaries appear to be owned by riparian municipalities. A serious difficulty encountered by lines operating on the Ohio and its tributaries is the matter of excessive wharfage charges.

According to representations of the packet lines out of Pittsburg and of the Pittsburg Chamber of Commerce it is said to be a common practice for the little towns along the Ohio and its tributaries to levy wharfage charges, and if the packet lines were to stop at each point from Pittsburg to Cincinnati the average cost would probably be from $40 to $60 per boat; hence in order to avoid this expense boat lines now stop only at the larger ports.

In many places, in addition to wharfage charges, a charge is made for so-called "agency service," in return for which the shipper has the

privilege of carrying the freight over the wharves. The result, in many places, is to make the rate by boat equal to, if not greater than by rail.

These charges in some instances run from one-fourth to one-third of the net profits of the boat; for instance, during the period from January 23, 1906, to January 3, 1907, these charges on a steamer running between Pittsburg and Charleston, W. Va., down the Ohio and up the Great Kanawha rivers, were $3,276.80; estimated to be about one-fourth the net profits of the boat during that period.

In a recent discussion of the wharf question Mr. H. D. W. English, president of the Pittsburg Chamber of Commerce, maintained that making the wharves a source of revenue should not be encouraged at the expense of water transportation and that every effort should be made to make the wharves as available for shipping as the railroads.

The packet line has to pay the wharf agents a commission of 5 per cent on all business in and out, at such cities as Hawesville, Ky., and Tell City, Ind. Where the "wharf boats" are owned by individuals they make a charge of 20 to 30 per cent of the boat freight for the privilege of landing. At rail competitive points this charge has to be absorbed by the steamboats to keep the business from going by rail.

At Parkersburg, W. Va., the shipper or consignee has to pay the agent's charges in addition to the regular freight rate of the boat, and the boat itself has to pay our city wharf charges ranging from $1 to $2 per week, as fixed by municipal ordinance.

At Rochester, Pa., the boats pay a landing charge and also an "agency fee" and in addition, the shipper or consignee pays for the use of the wharf or wharf boat.

In a statement to an agent of the Bureau of Corporations in the summer of 1907 Mr. W. H. Williams, traffic manager of the Pittsburg Chamber of Commerce, said:

> It is useless to think of spending $50,000,000 for the improvement of the Ohio River if the local communities are to make charges which will prevent the merchants trading at the various towns along the river. The only use that could be made of the river would then be for such cargoes of coal and other commodities, for which a boat would not find it necessary to stop along the river.

The Cairo Trust Property is a corporation that some sixty years ago owned the neck of land on which Cairo is situated. This corporation sold land from time to time, and wherever the land sold was situated on the river front the corporation retained the right of assessing and collecting wharfage. In 1876 the "Trust Property" was sold by the United States court at Springfield, Ill., in foreclosure proceedings. A reorganization was effected in this court and the affairs of the company passed into the hands of two trustees, Henry and Edwin Parsons, of New York. George Parsons acts as general agent for the trustees at Cairo.

The rates of wharfage obtaining at Cairo are shown in the following copy of the tariff of the corporation. These rates apply along that part of the Ohio River front that has been improved by the trustees of the Cairo Trust Property, which extends from Fourth street to Eighth street. Outside of these limits on the unimproved river front the rates are subject to special agreement, all wharfage charges going to the Cairo Trust Property.

RATES OF WHARFAGE

Two and one-fourth cents per ton in advance, hull measurement, on all boats and barges for the use of the landing for twenty-four hours or less, and one-half these rates for additional time; provided, no boat shall pay less than $5 for each and every twenty-four hours or less. For boats remaining but six hours a reduction upon these rates of 25 per cent will be made, and upon the payment of one full wharfage for twenty-four hours on boats going downstream they will have the right to land on return on same trip without additional wharfage; provided, no boat shall pay less than $5 for each and every twenty-four hours or less. Any departure from these rates will be by special agreement, but boats used exclusively in towing, and boats landing for repairs or supplies only, will not be charged for landing at river bank in location to be designated by wharf master, the time for use of landing by towboats and boats landing for repairs and supplies to be limited to a reasonable time to be fixed by wharf master.

LUMBER

Barges containing 200,000 feet and under, $2 per barge, each load.
Barges containing 200,000 to 500,000 feet, $5 per barge, each load.
Barges containing 500,000 to 800,000 feet, $8 per barge, each load.
Barges containing 800,000 feet and upward, $10 per barge, each load.

TIES

Boats and barges of ties unloading at Cairo, 80 cents per 1,000 ties; but no boat or barge shall pay less than $2 for each load.
All loads to be estimated by wharfage collector.

Following is the blank form of receipt issued by the Cairo Trust Property for the use of river landings:

No. ——: CAIRO, ILL., ———, 190–.

Steamer ——— To Henry Parsons and Edwin Parsons, Trustees of the Cairo Trust Property, Dr.

For use of landing ——— tons at rates as per other side, ——— dollars.
Received payment.

HENRY PARSONS and EDWIN PARSONS,
Trustees.

$——. By ——— ———
Wharf Master.

At Cincinnati there is a public landing, which includes that portion of the river front extending from the east line of Broadway to the west line of Main street, and the river termini of various streets are improved to low-water mark.

Wharfage fees for the use of the public landing, as established by ordinance of 1902, are:

For wharf boats: One-half cent per day for each lineal foot of the water front occupied.
For steamboats and other water craft:
For the first twenty-four hours–
10 to 150 tons register, $1.50.
Over 150 tons register, $2.50.
More than twenty-four hours and less than twelve days, 1½ cents per ton.
More than twelve days, $1 per day.
For barges and model barges, $2.50 per day.

For the use of street termini the charge for mooring steamboats, barges or other water craft, and rafts of logs and lumber other than wharf boats is $1 per day for certain streets and 50 cents per day for others. For cargoes discharged on the public landing and remaining more than four days a charge of 10 cents for each 100 square feet occupied is made.

In 1904 the city council of Cincinnati passed an ordinance authorizing the Louisville and Nashville Railroad to construct elevated tracks above the public landing, but the railroad company was enjoined from constructing the tracks and ordered to remove the portion built, and this order was affirmed in June, 1907, by the supreme court of Ohio, which held not only that the city council had no power to make such a grant, but also that—

> It is not in the power of the legislature, unless in the exercise of the power of eminent domain, to authorize property dedicated to the public for a specific purpose, to be used for a purpose inconsistent with the purpose for which it was dedicated.

Certain landings and wharf lots are leased by the city to coal companies and others at an aggregate rental in 1906 of $21,723. There is a perpetual lease of one wharf to the Ohio and Mississippi Railroad (Baltimore and Ohio Southwestern) for $1,725.

Apparently no city ordinance regarding wharfage has been passed at Marietta, Ohio, since the ordinance of April 6, 1869, amended August 9, 1871. This ordinance provides that each steamboat and craft not more than 90 feet in length shall pay a wharfage charge of $2 for the first twenty-four hours and $1 for each subsequent twenty-four hours, and each barge, keel, or flatboat $1 for each twenty-four hours and $1 for each subsequent twenty-four hours.

The city council is empowered to make such change by resolution as may be deemed expedient. The wharf master has the power during the interval between city council meetings to make such temporary arrangements as he may deem advisable for the best interests of the city, but such arrangements shall not be enforced beyond the succeeding council meeting unless sanctioned by the council.

The wharf master is appointed annually by the mayor. Wholesale houses at Marietta doing a regular business by river pay an agency charge of $60 per year to the owner of the wharf boat. Those houses whose business is not extensive enough to warrant this expenditure pay a charge ranging from 1 to 2 cents per hundred pounds. All packets touching at Marietta land at the wharf boat except the steamer *Sonoma*. Gasoline boats do not use the wharf boat, but land at the marine at the foot of Fourth street, paying the city a wharfage charge of about 50 cents a landing. Gasoline boats handle their own freight and pay no agency charge for this purpose. Shipments from Columbus, Cleveland, Chicago, and other points north and west of Marietta are consigned to the care of the wharf boat at Marietta and forwarded by the proprietors of the wharf boat to points as far as Matamoras, Ripley, and West Union, Ohio. On these shipments no through rates are made, local rates being charged by the railroad and also by the packet line. When necessary to get business the boats sometimes cut down their rates, but the railroads make no rate concessions. The amount received by the city of Marietta during the calendar year 1906 for wharfage and for the license for the maintenance of the wharf boat was $1,088.96. The wharf master's chief revenue is derived from the agency charges that he makes to consignees and shippers. The wharf boat is owned by Hornbrook & Best, Mr. Hornbrook being the city wharf master. The agency charges amount to about 20 per cent of the freight rate charged by the packet line.

No city wharfage charges are paid at Point Pleasant, W. Va., and the wharf master receives no salary from the city. The city keeps up about 150 feet of river front as a public landing. The only income that the city receives from this river front for landing purposes is a license fee of $50 for the maintenance of the wharf boat at the public landing. This privilege is held by Mr. S. G. Gardner, who also operates the steamer *Gondola* between Charleston and Gallipolis. A yearly charge of about 25 cents per short ton is made as an agency fee to the wholesale houses doing business over the boat. This is the basis of the yearly charge made to wholesale houses doing a considerable business. Such houses as do not have a business sufficiently large to warrant a yearly payment and other consignees and shippers pay about 20 per cent of the carrier's rate as an agency charge. Very little income is derived by the wharf boat from storage charges, since shipments are removed, as a rule, almost as soon as landed. Where goods are left at the wharf boat for a month or more, the storage charge per month is about one-third the carrier's rate.

Wharfage charges at Wheeling, W. Va., are based upon the number of the landings a boat makes per week. A large boat making a landing each way per week pays $2 per week. This is the price paid by the Pittsburg and Cincinnati Packet Line for each boat and by the steamer *Kanawha* running between Pittsburg and Charleston. Smaller boats do not pay so much. The steamer *Lorena* pays $1 per week (50 cents each way), as does also the steamer *Greenwood*. The steamers *Bessie Smith* and *H. K. Bedford* pay $1.50 a week, making three landings. The steamer *Royal* pays $3.50 per week, landing every day, while the steamer *Ruth* (a smaller steamer) pays $3 per week for the same number of landings. The wharf boat is owned by Crockard & Booth, who pay a city and county tax as well as a license fee to the city for the privilege of mooring their boat at the public landing. The license fee amounts to $75 per year. The wharfage charge paid by boats goes to the city. At the same time boats pay the owners of the wharf boat a percentage for collections made for them as well as for business secured; that is to say, business passing over the wharf boat. Another source of revenue to the wharf boat is for storage of goods after twenty-four hours from receipt of same. The wharf master at Wheeling is elected by popular vote and serves for two years. There is a railroad track along the street at the top of the river bank. Both the Pennsylvania and the Baltimore and Ohio railroads use this track and frequently obstruct the passage to and from the wharf boat.

At Pittsburg the Pittsburg Harbor proper is formed by the dam at Davis Island in Ohio River just below Pittsburg. This dam creates a basin as far up the Monongahela River as Dam No. 1 and up the Allegheny River as far as Herr Island Dam. Improvements in the depth of the harbor and facilities for navigation are described at length in the annual reports of the Chief of Engineers. With the exception of paving the somewhat steep river bank west of the Smithfield Street Bridge little attempt has been made by the city to improve its dock facilities. Along this bank lie four wharf boats:

1. The wharf boat of the Monongahela and Ohio Packet Company.

2. The so-called Patterson wharf boat, owned jointly by the Pittsburg, Wheeling and Parkersburg Packet Company, the Ohio and Great Kanawha River Packet Company, operating the steamer

Kanawha, the Pittsburg and Kanawha River Packet Company, operating the steamer *Greenwood*, and the Monongahela and Ohio Packet Company. Each of these companies owns one-fourth of the wharf boat, and the agent of the Monongahela and Ohio Packet Company at Pittsburg acts as local agent at Pittsburg for these lines.

3. The wharf boat of the Pittsburg and Cincinnati Packet Line.

4. The wharf boat of the Monongahela River Consolidated Coal and Coke Company.

Below these wharf boats little or no effort has been made to improve the landing facilities. Klein's excursion steamer and barges and some of the river coal companies have landing privileges, and the A. K. Boyd Coal Company maintains a small supply boat for its craft.

On the Allegheny River side of Pittsburg Harbor some retail coal companies and sand dredging companies have landing privileges, maintaining boats for discharging their craft. None of the lower river boats are made up on this side of the harbor, however, not below "The Point," which is the point of land in Pittsburg city between the Monongahela and Allegheny rivers where they unite to form the Ohio.

The north shore of the Monongahela River from Grant street to The Point and the south bank of the Allegheny from Ninth street to The Point are said to include the area deeded by the Penn heirs in 1784 for use as city docks forever. The other portions of the river front are owned by the Baltimore and Ohio Railroad Company, the Pittsburg and Lake Erie Railroad Company, the Pennsylvania Railroad Company, and various iron and steel mills, etc.

There exists a good deal of uncertainty regarding the ownership of the river front. The deed of the Penn heirs referred to is on file at the court-house at Greensburg, Pa. Judicial decisions involving a construction of this deed are reported in 46 Pa. 253, 16 S. and R. 268, and 104 Pa. 472.

The second edition of the Ordinances of Pittsburg of 1897, page 333 et seq. and page 347 et seq., gives the ordinances of the city now in force relating to wharf and harbor matters. A new digest was being prepared, and a proposed ordinance radically changing these ordinances and increasing the charges to be made was being considered by the city councils in June, 1907.

The administration of the docks and wharves at Pittsburg is under the department of public works, bureau of city property.[1] The docks are in the care of the wharf master of the city, who is appointed by the director of public works. The salary of the wharf master is $1,100 per month and he has two assistants compensated at the rate of $1,100 per each. These salaries for the year ending January 31, 1907, amounted to $2,552.31, and this was the entire annual expenditure by the city for the maintenance of the wharves during that year, although the receipts for the same period amounted to $15,[illegible]. The business appears to have been turned into the general fund of the city, although under the terms of the deed of the Penn heirs to the city of Pittsburg the city is not authorized to charge more than enough to maintain the wharves.

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[1] The ordinance of December 17, 1867 (Ordinances of Pittsburg, 1897, second edition, p. [illegible]).

The wharfage charges, as set forth in an ordinance of the city approved February 4, 1882, are as follows:

For each and every time any boat, barge, or vessel shall land for the purpose of loading or unloading, said boat, barge, or vessel shall pay as follows:

Passenger or freight boats making monthly or semimonthly trips for each boat of—

200 tons measurement	per trip..	$4
200 to 300 tons measurement	do....	5
300 to 400 tons measurement	do....	6
400 to 500 tons measurement	do....	7
500 tons and upward	do....	8

Vessels not to remain at the wharf more than seventy-two hours, exclusive of Sundays, and for each succeeding seventy-two hours or fraction thereof said boats to be charged at the rate of $1 less than this rate in each case.

For each and every boat making weekly trips and not remaining at the wharf more than twenty-four hours, $2.50 per trip.

For each and every boat making three trips per week, $4 per week.

Towboats of 130 tons and upwards, not remaining at the wharf longer than ten days, 2 cents per ton measurement per trip.

Harbor boats, $16.67 per year. Small tugboats, $10 per year.

Model barges, $6.25 per trip; keel or brick boats, $5 per trip, and not to remain at the landing more than five days.

Flat boats containing glass-house sand, wood, etc., $2 per trip.

River sand and gravel flats, 25 cents per day.

Empty barges, keel boats, or flats at that part of the wharf allotted for loading and unloading, $1 per day.

For unloading coal flats, $1.25, coal barges, $2, coal boats, $3 per trip each.

Produce, hay, and other flats, $2.50 per trip each.

Round and hewed logs, $2.50 per 1,000 running measure, and $1.25 per day for each day exceeding three.

Boards and planks, 8¾ cents per 1,000.

Shingles, staves, heading, and hoop poles shall be rated at 4,000 per 1,000 feet of board measure and shall pay the same rate as boards.

Each vessel lying at any wharf or landing not for the purpose of loading or unloading shall pay the following rates:

Steamers and towboats, 1 cent per ton for each ton measurement per month.

Each barge, $2 per month.

Each keel or brick boat, coal barge or flat, $1 per month.

Each floating wharf, receiving or discharging boat, $1 per month.

Wharf boats engaged in commission business, $300 per year in addition to the rate charged for wharfage.

Skiff floats, $2 per month.

Boat clubs, $2 per month if at paved wharf and $1 per month if at unpaved wharf.

Bath boats free of charge at points to be designated by the wharfmaster.

The committee on wharves and landings is empowered by the city councils to make special contracts with parties using landings by the year.

The mayor of Pittsburg is an advocate of increased wharfage rates. As already pointed out, the wharves of Pittsburg were deeded to the city by the Penn heirs, the deed expressly stipulating that the city of Pittsburg should not charge more than an amount sufficient to maintain the wharves in good condition. For this reason it is believed by some of the citizens of Pittsburg that the municipal government has no authority to increase these rates or even to charge those in force at present.

There are no harbor dues nor other charges separate from wharf charges. A nominal sum is paid to the city for the privilege of mooring a wharf boat. This in the case of the Pittsburg and Cincinnati Packet Line has amounted to $12 per year, besides which the line has paid the regular rates of landing charges for its steamers. A proposed new ordinance under consideration in June, 1907, in the city council contemplates changing this nominal charge to a certain rate per foot of river front used.

At several points on the Monongahela River the landing facilities are very poor. At Monessen, where are situated the mills of the Pittsburg Steel Company, the Page Wire Fencing Company, and other mills, the boats are unable to get any landing at all, owing to the tracks of the Baltimore and Ohio along the shore. At Charleroi conditions are somewhat similar, and even at Fairmont, W. Va., the boats are compelled to land on the other side of the river from the business portion of the town, since the rest of the river front on both sides is controlled by the Baltimore and Ohio Railroad.

TABLE 31.—*Wharfage charges at towns on Ohio River between Pittsburg and Cincinnati*

	West.	East landing.		West.	East landing.
East Liverpool, Ohio	0.10		Huntington, W. Va.	0.20	.....
Wheeling, W. Va.	1.00		Catlettsburg, Ky.	1.00	.....
Martinsville, Ohio		0.25	Ashland, Ky.	1.00	.....
New Martinsville, W. Va.	1.00		Ironton, Ohio	1.00	
Sistersville, W. Va.	1.00		Greenup, Ky.		0.20
St. Marys, W. Va.		20	Portsmouth, Ohio	1.00	
Marietta, Ohio	1.20		Maysville, Ky.	1.20	
Parkersburg, W. Va.	1.20		Rome, Ohio		20
Ravenswood, W. Va.		25	Manchester, Ohio	1.20	
Pomeroy, Ohio	1.25		Maysville, Ky.	1.00	
Middleport, Ohio	1.00		Ripley, Ohio	1.20	
Point Pleasant, W. Va.		20	Higginsport, Ohio		20
Gallipolis, Ohio	1.00		Augusta, Ky.	[illegible]	
Town City, Ohio		25	New Richmond		25
Millersport, Ohio		25	Cincinnati, Ohio	1.20	

[a] Five cents, Tuesday or Wednesday is business.

PORT TERMINALS ON THE MISSISSIPPI

Terminals at St. Louis

The harbor and wharf commissioner of St. Louis, in a letter to the secretary of the Business Men's League of St. Louis, dated April 11, 1917, describes the water-front terminal facilities of the city as follows:

The city of St. Louis, Mo., has a water front along the Mississippi River of 19 miles, of which 7 miles are owned by the city and designated as a public wharf. These and one-half miles are improved for wagon traffic, with asphalt, macadam, and granite block pavements. The public wharf varies in width from 300 feet to 900 feet.

The city charter adopted in 1914 defines the harbor and provides that the jurisdiction of the harbor and wharf commissioner shall extend over all lands, river lands, and beach bordered, condemned, or belonging to the city for wharf purposes, within the city and over so much of the Mississippi River and to the middle of the main channel thereof, as lies immediately in front of the city over which the city has control.

The harbor and wharf commissioner is appointed by the mayor and confirmed by the city council for a term of four years.

Private ownership of the river front has never been interfered with.

The river traffic has not any direct railroad connections. All freight handled by boats is unloaded upon the public wharf and is brought to or taken from the wharf by teams. The public wharf constitutes the city water terminal facilities here, and is ample to accommodate all steamboats arriving at this port.

There is a local railway engaged in transferring freight in carload lots to merchants and manufacturers on the different main lines. It is owned and controlled by private corporations.

Freight is handled in crossing the river by means of two bridges and by ferry boats provided with tracks, accommodating 16 cars.

The dimensions of steamboats plying here are about 250 feet long and 45 feet beam, with a draft of 4 feet loaded.

The harbor and wharf commissioner of St. Louis, is the head of the harbor and wharf department and a member of the board of public improvements. This board makes all contracts and leases (except those made by the city council by ordinance) and has the supervision of the accounts and expenses of the department; all bills must be approved by the president of the board, who is elected by popular vote. The salary of the harbor and wharf commissioner is $3,000 year.

The wharf department of St. Louis is self-supporting and receives nothing from the general fund of the city. Before the wharfage charges on steamboats were abolished in 1904, the rate was 3¾ cents per ton on the hull measurement. This rate applied alike to all classes of boats, except that boats owned and paying taxes in St. Louis were allowed a reduction of 40 per cent, making the charge 2¼ cents per ton (hull measurement). Payment of this wharf charge gave a boat of 200 tons or less the privilege of lying at the wharf for seven days; one of 300 tons, for eight days; one of 400 tons, for nine days; one of 500 or more tons, for ten days.

In 1904, an ordinance was passed allowing steamboats to land without payment of wharfage, the receipts from other sources being sufficient to maintain the river front and city wharves.

The following statement shows the receipts and expenditures of the harbor and wharf department for the fiscal year ending April, 1907:

RECEIPTS

Lumber, at 10 cents per M	$392.10
Any lumber unloaded on river front from railroad or from rafts, except lumber from steamboats on which there is no wharfage charge.	
Firewood, at 10 cents per cord	267.45
Skids	18.00
Used to place under freight piled on wharf; rate is 6 cents per skid per annum to stevedore contractors to keep on wharf.	
Steamboat wharfage	159.37
Accrued before steamboat wharfage charges were abolished.	
Ferry licenses	7,350.00
Miscellaneous rents:	
Wharf boats	2,535.00
Landings for sand boats	3,093.00
Track privileges from railroad companies on unimproved wharf, i. e., river front	49,228.12
Elevators (ground rent on land on which "river houses" stand)	720.00
Cotton compress companies	900.00
Lumber companies (yards for storing lumber)	6,372.63
Rowing clubs	180.00
Services of harbor boat pumping out sunken boat	35.00
Miscellaneous commodities stored on river front, as coal, ice, general merchandise, etc	7,037.00
Total	78,287.67

EXPENDITURES

Office expenses (salaries, etc.)	10,977.41
Harbor-boat expenses	12,541.45
Cleaning levee and removing obstructions in river	9,859.70
Repairs to wharf, labor, etc	14,924.37
Total	48,302.93
Net receipts	29,984.74

This balance goes into the harbor fund, which is kept distinct from *the general fund* of the city.

Railroad and ferry companies own or control a large part of the river frontage at St. Louis. There is also, as previously noted (p. 129), evidence of an understanding among members of the St. Louis Steamboat Managers' Association, which controls the greater part of the most available landings, that none of them shall aid a new line to secure wharf facilities.

Terminals at Memphis.

At Memphis wharfage is assessed by the city under an act passed by the General Assembly of the State of Tennessee, March 29, 1893. The act reads:

> That there is hereby levied a wharfage tax upon all steamboats and other water craft landing at such territory to grade and pave such wharf and to keep the same in proper and safe condition for use, as follows, viz:
>
> All steamboats, barges, and steamboat hulls used as barges, and all wharf boats, shall pay 2½ cents per ton in the under deck capacity, which shall entitle them to all the privileges of the wharf and landing to receive and discharge freight and passengers for the space of one week. *Provided*, That all steamboats, barges, and steamboat hulls used as barges that remain at the landing for the space of six hours or less shall pay the following rates of wharfage, viz:

For 100 tons and under	$2.50
From 100 to 200 tons	1.00
From 200 to 300 tons	1.50
From 300 to 400 tons	2.00
From 400 to 500 tons	3.00
From 500 to 700 tons	4.00
From 700 to 800 tons	5.00
From 800 to 900 tons	6.00
From 900 to 1,000 tons	8.00
From 1,000 tons and more	10.00

> and one-half the above rates for each additional six hours or less which they may remain after the free term of six hours.
>
> All farmers shall pay $1 for landing and $4 for each week or $1 for each day they remain at the landing, Sundays excepted.

Under this act the receipts during 1906 were $11,304.45 and the expenditures $5,440.74. The balance is kept in a fund to improve and maintain the river front. The wharf master is elected for two years by the police board and the board of public works in joint session.

The wharf boat at Memphis is owned by the Consolidated Wharf-boat Company. The stock of this company is held by the Arkansas River Packet Company and the Memphis and Arkansas City Packet Company, each owning 50 per cent. The boats of these two companies use the wharf boat, as do also the Cincinnati and St. Louis boats of the Lee Line.

Terminal Facilities at New Orleans.

The port of New Orleans extends for nearly 15 miles along the Mississippi River, from Westwego and Southport, above the city to Chalmette, 5 miles below Canal street. On the west shore of the river, opposite the city, are landings at Westwego, Harvey's Canal, Gretna, Algiers, and McDonoghville. Westwego is the terminal of the Texas and Pacific Railroad, while the New Orleans Terminal Railway, whose tracks connect with nearly all the railroads on the east bank, ends at Chalmette.

THE WATER FRONT

The river is from one-half to three-quarters of a mile in width, and the depth within 10 feet from the banks ranges from 40 to 100 feet. The harbor is well sheltered. The current of the river is not too strong for unloading in midstream, although most of the vessels land broadside along the wharves, which are constructed on piling and extend out into the stream, in some places from 50 to 100 feet. This whole wharfage front on the left bank of the river, which is the bank on which the greater part of the New Orleans population lives, is approached by streets and by lines of railroad tracks which permit cars to come on the wharf and load directly into the ships.

As the Mississippi rises far above the level of the streets of New Orleans in times of flood, great banks of earth have been thrown up to protect the city and suburbs from its invasion, and these levees serve the purpose of marginal streets along the water front, the wharves, however, extending in some cases over the levees.

Along the levee above Canal street are the wharves of the Leyland-West India Line, the Head Line, the Elder-Dempster Line, the Cuban Line, the Creole Line, and others. A short distance below Canal street are the wharves of the Morgan Line, running a regular line of steamers to New York, and just below their wharves are those of the Harrison Line, which trades to Liverpool.

The wharves and storage sheds at Westwego, which afford 2,700 feet of wharf room, belong to the Texas and Pacific Railroad, and are used almost exclusively for its shipments. Four or five miles farther down the river, at Gretna and Algiers, are the terminal wharves of the Southern Pacific, with a wharf space of 870 feet and docks capable of accommodating four or five ocean steamers at one time. Several miles farther down the river the United States naval station has a large floating dock, which is utilized mainly in repairing vessels of the merchant marine. On the east bank of the river are nearly five miles of public wharves and about one mile of privately owned railroad wharves.

Port Chalmette is owned and operated by the New Orleans Belt and Terminal Company, and their property has a capacity for the storage and warehousing of cotton for something like 200,000 bales. The grain elevator has a capacity of 500,000 bushels, running 10,000 bushels per hour into a vessel's hold. Their wharf accommodation on the river front is about 3,800 feet, with sheds along the line, and a storage capacity for large quantities of general cargo. Their track reaches all around the city, crossing every railroad coming into it, and connecting at Avondale (the upper limit of the port) with the railroads on the other side of the river, viz, the Southern Pacific, and the Texas and Pacific railroads.

The Illinois Central Railroad has 3,500 feet of water front with two elevators of 1,000,000 bushels capacity and 1,500,000 bushels capacity, respectively, at the Stuyvesant Docks. This latter elevator of the Illinois Central Railroad is one of the largest and finest in the United States. It is erected just above the site of the Stuyvesant Docks, and the wharfage has been expanded thereby 2,000 feet, giving the Illinois Central Railroad a total of 5,500 feet of river front

at Stuyvesant Docks. The elevator is constructed of the most modern material and equipment, and is able to receive 100,000 bushels of grain per hour. Four steamships can be loaded at the same time, and the product of the great river valley can be poured into their holds at a rate of 80,000 bushels per hour. Besides the wharf facilities at Stuyvesant Docks, the Illinois Central Railroad also controls Southport, with two elevators of a total capacity of 500,000 bushels, and a frontage on the Mississippi River of some 1,600 feet.

The Texas and Pacific Railroad has an elevator of 1,000,000 bushels capacity.

The board of port commissioners has been authorized to issue $2,000,000 of bonds for building wharves, sheds, paved approaches, and other port improvements. The board has well under way a comprehensive system of sheds, approaches, and new wharves, which it is claimed will within the next few years make the harbor of New Orleans second to none in the country. The public wharves are rapidly being covered with steel sheds.

Besides the annual appropriations by the National Government for keeping the harbor in condition, the board of port commissioners keeps a dredge boat continually at work removing deposits that frequently form shoals in the river, especially after high water. The board also maintains a fire boat, which renders aid without charge in case of fire on any vessel or wharf.

MECHANICAL APPLIANCES

Endless chains are used for loading and unloading sugar and molasses, and similar chains to which pouches are attached are used in unloading tropical fruit ships.

In most cases spur tracks run from the main railroad tracks to the ship's side, to permit direct loading and unloading.

The city of New Orleans is now constructing a belt railroad system which will encircle the entire city and will be owned and operated by the city. It is already constructed along the river front, serving nearly all the wharves along the left bank, and is in partial operation. When completed it will connect all the railroads.

ADMINISTRATION

The administration of the river front and the right to fix and collect wharfage rates was first granted to the city of New Orleans by the State of Louisiana in the charter of 1836. The city, however, could not exact charges in excess of the cost of facilities erected for the accommodation of shipping, together with the cost of administration; that is, in excess of the amount required for running expenses, extensions and improvements and for the sinking fund and interest on bonds. Thus the administration of wharves was an expense and not a source of revenue to the State. From the constitution of the municipalities in 1852 until 1901 the city retained direct control of the wharf system for only about fourteen years, the remaining thirty-five years being covered by leases to private individ-

uals. In 1891 the last lease of the wharves was made to Charles K. Burdeau (afterwards the Louisiana Construction and Improvement Company), for a term of ten years. The annual reports of the last lessee show that during the ten years of its lease it declared more than $600,000 in dividends.

The lease system was so unsatisfactory to the public that in 1896, after five years of declining commerce, the State legislature created a commission to take charge of the port.

The board of commissioners of the port of New Orleans is the outcome of many years of effort on the part of the commercial exchanges, the industrial bodies, and others interested in the welfare of the port of New Orleans. This board, which is composed of prominent business men who serve without pay, not only takes the place of the wharf lessee, but also combines the duties formerly devolving upon the harbor masters, port wardens, wharfingers, and contravention clerks. The act creating this board, passed in 1896, provided for the purchase of the wharf lease from funds then in the city treasury; but this fund having been diverted by subsequent legislation to drainage purposes, and the city not being financially able to appropriate other funds for the purpose, the board of port commissioners, from its organization on the 5th of September, 1896, to the date of termination of the lease, May 29, 1901, only performed the duties of administration of the wharf system formerly devolving on the commissioners of public works, together with the duties of harbor masters and port wardens.

On May 29, 1901, the board of commissioners assumed charge of the wharves and landings of the port of New Orleans, and the wharfage rates were reduced from a fixed charge of 12 cents per ton, whether the vessel remained at the wharf a period of one or sixty days, to the rates established by the amendatory act of 1900—namely, a charge of 2 cents per ton per day for the first three days, and 1 cent per ton per day for the next three days, making the maximum charge 9 cents per ton and the minimum charge 2 cents per ton. Payment of the maximum charge allows vessels to remain at the wharves a period of thirty-six consecutive days. There is no charge whatever on the cargoes entering the port. New Orleans is one of the very few if not the only port in this country charging no wharfage for merchandise.

The employees of the board are a superintendent and a secretary, each receiving an annual salary of $3,000; two engineers, receiving annual salaries of $2,400 and $1,600, respectively; four deputy commissioners, one collector, a superintendent of construction, a bookkeeper, and twelve other employees—inspectors, messengers, and assistants. The total cost of administration is less than $33,000 per annum. The board also maintains a patrol system of policemen at a cost of about $22,000 per annum.

There is no income from rentals, leases, etc., all the income being from the sources stated above. All the funds received are used for the improvement and extension of harbor facilities, and for the redemption fund to retire the bonds which were issued for the improvement of the wharves.

The more significant portions of the act creating the board of commissioners of the port of New Orleans (Laws of 1896, Act No. 70, as

amended by Laws of 1902, Act No. 38, Revised Laws, 1904, pp. [illegible] are reproduced below:

Whereas the port of New Orleans has been gradually extended until it has reached beyond the limits and jurisdiction of the city of New Orleans; and

Whereas the divided authority of these parishes and the multiplicity of officials with their various fees, and the development of numerous conflicting [illegible] interests will not uniformly and impartially to the traffic of the port; and

Whereas the fact in assessing excessive fees, charges, etc., is of such proportion as to threaten to divert the trade to less expensive ports; and

Whereas the supervision and control of an intelligent board of trade commissioners can consolidate the services of various number and variety, which supervisionments, wharfingers of these parishes and the act of congressional appropriations as a national expense; can improve the wharves and other terminal facilities of the port and greatly develop and expand its commerce by removing many of the obstacles now placed in the way of its advancement; and

Whereas the public interest of the nation to appear in the passage of this act has been given as required by article [illegible] of the constitution. Therefore

Appointment of commissioners—Term of office

Section 1. *Be it enacted by the general assembly of the State of Louisiana.* That the governor of the State of Louisiana is hereby authorized to appoint a board of commissioners to be known as the "board of commissioners of the port of New Orleans," and board to consist of five members, who shall be citizens of the United States and reside within the port limits of New Orleans, in the parish of Orleans, Jefferson, or St. Bernard, and at the time of their appointment must be professionally identified with the commerce or business interests of the port of New Orleans. One of said commissioners shall be appointed for a term of three years, one for four years, one for five years, one for six years, and one for seven years. At the expiration of their term their successors shall be appointed by the governor for a period of five years each. The board shall have the power to fill the unexpired term should any vacancy occur through death, resignation, or other cause.

Duties of commissioners—Wharves and warehouses—Charges, etc., may increase, etc.

Sec. 2. *Be it further enacted, etc.* That said board of commissioners shall have the power to regulate the commerce and traffic of the port and harbor of New Orleans in such manner as may, in their judgment, be best for its maintenance and development. They shall have and enjoy all the rights, powers, and immunities incident to corporations. They shall be authorized and it shall be their duty to take charge of and administer the public wharves and landings in the port of New Orleans, to construct new wharves when necessary, and to erect sheds on the wharves and landings to protect merchandise in transit, to dredge and keep the wharves and landings in good condition, to maintain sufficient depth of water, and to provide for lighting and policing such wharves and sheds and landings. They shall establish rates and charges upon shipping using the port of New Orleans, for the use of wharves, etc., of the port of New Orleans. The following rates of wharfage shall apply: [illegible] per day, based upon the gross tonnage of the first three days, and the sum of [illegible] per day for the next three succeeding days, making a maximum charge of [illegible] for the gross tonnage, and thereafter and [illegible] shall be free of charge for a period of [illegible] days.

That any part of a day shall be considered a full day as to the above charges, and the above charges shall be based upon a single voyage.

Vessels which are provided by said board of commissioners, shipping using same shall pay an additional charge. Said charge shall be [illegible] the use of the wharfingers, maintenance and management of said improvements for which purpose it shall apply [illegible] wharfage which is charged by charter provisions already established of [illegible] in accordance with provisions of section 200 of the constitution. Wharves, warehouses, sheds, etc., shall be built and maintained and used by the owners of wharves or vessels. As amended by act of 1902, p. [illegible].

Revision of rates and charges and expenses

Sec. 3. *Be it further enacted, etc.* That should the income within the maximum rates herein authorized be more than sufficient to carry on the affairs of the com-

mission, they shall make said charges conform to the necessary expenditures. The charges on barges, steamboats, and other river craft and luggers, shall be carefully calculated by the commissioners and the reduction of same shall accord with the charges on seagoing vessels. (As amended by Act 36, 1900, p. 44.)

Repeal of certain laws and retaining others

SEC. 4. *Be it further enacted, etc.*, That all laws and ordinances regarding the appointment and fees governing harbormasters, masters, and wardens, wharfingers, wharf superintendents, and any and all laws in conflict with this act are hereby repealed, and the authority and control heretofore vested in them is hereby vested in the board of commissioners for the port of New Orleans, who shall employ sufficient persons to be known as deputy commissioners not exceeding five, who shall under direction and supervision of the board perform the duties now devolving upon the harbormasters, master, and wardens, wharfingers, etc.

All laws within the jurisdiction of this commission and ordinances of the city of New Orleans imposing penalties for violating the rules and regulations governing the management of the wharves and landings, in force and effect, July 9, 1896, shall remain in force and effect and may be enforced by said commissioners. (As amended by Act 36, 1900, p. 44.)

Right to purchase and expropriate wharves

SEC. 9. *Be it further enacted, etc.*, That the board of commissioners herein created be, and is authorized and empowered to acquire by purchase or expropriation, the lease of the wharves now held by the Louisiana Construction and Improvement Company, or of any other wharves and landings, and it is made the duty of the common council of New Orleans to provide for the payment of the price of such purchase or expropriation, out of the funds under their control: *Provided*, That the price to be paid shall be satisfactory to the said council. Said commission shall have the power to expropriate any property, wharves, or landings necessary to be expropriated for the benefit of the commerce of the port and harbor of New Orleans in accordance with the expropriation laws of this State. (As amended by Act 36, 1900, p. 44.)

The amendatory act of 1900 reduced the prescribed wharfage and dockage charges and extended the power of the board of commissioners to acquire property by purchase or expropriation to any property, wharves, or landings necessary to be acquired for the benefit of the commerce of the port.

STATISTICS OF COMMERCE ON INTERIOR RIVERS

TRAFFIC ON THE OHIO AND MONONGAHELA

The movement of coal down the Ohio is one of the most important factors in relation to the traffic of that river. From the Monongahela, Big Kanawha, and other rivers tributary to the Ohio large quantities of coal are hauled in barges to all of the important cities located on this river. St. Louis, Memphis, New Orleans, and other important cities, also receive a great quantity by way of the Ohio and Mississippi rivers.

In Table 11 will be seen a comparison of coal traffic hauled by the rail lines, and that carried by boats on the Monongahela and Ohio rivers, to Pittsburg and beyond, 1900–1906.

The shipments by rail have increased gradually and that of the river likewise, except for the year 1904, when a noticeable decrease is shown. The tonnage hauled by water averaged about 30 per cent for the period shown. This striking proportion of coal traffic hauled by water brings out the importance of the Monongahela River as a navigable waterway.

TABLE 11.—*Shipments of coal by rail through Pittsburg by rail and river from 1900 to 1906*

[From Geological Survey, Mineral Resources of the United States]

Transportation route.	1900.	1901.	1902.	1903.	1904.	1905.	1906.
Pennsylvania R. R.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
To Pittsburg and vicinity	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	[a] 1,[illegible]	
To west of Pittsburg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Baltimore and Ohio R. R.							
To Pittsburg district	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
To west of Pittsburg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Pittsburg, Cincinnati, Chicago and St. Louis R. R.	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	
Allegheny Valley Ry.							
To Pittsburg district	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
To west of Pittsburg	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Pittsburg and Lake Erie R. R.							
Lake and Pittsburg	1,[illegible]	1,[illegible]	[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	
To west of Pittsburg	[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Pittsburg, Cincinnati and Youghiogheny Ry.		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	
Wheeling and Lake Erie R. R.						[illegible]	
Total by rail	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Monongahela River route							
To Pittsburg district	1,[illegible]	[illegible]	1,[illegible]	1,[illegible]	[illegible]	1,[illegible]	[illegible]
To west of Pittsburg	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	1,[illegible]	[illegible]
Total by water	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total shipments	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Per cent moved by rail	72	68	66	69	71	72	74
Per cent moved by water	28	32	32	31	29	28	26

[a] Includes shipments over the Allegheny Valley Railway, now practically a part of the Pennsylvania system.

[b] By rail to Pittsburg district.

[c] Coal originating on the road only. Does not include coal received from the Pennsylvania R. R. and forwarded over the Allegheny Valley Ry.

[d] By rail to west of Pittsburg.

[e] Included in Pennsylvania R. R. shipments.

Excessive of tonnage delivered to Pittsburg and Lake Erie R. R., which is included in shipments reported by that company.

[f] West Side Belt and Wabash Pittsburg Terminal railways.

[g] Including coal mined in pools Nos. [illegible] and 2 and consumed by vessels along the Monongahela River.

Table 12 shows in more detail the movement of coal by rail and by water to Pittsburg, and to west of Pittsburg. As will be noted, more than half of the coal to Pittsburg is carried by water, the proportion of the water shipments being 37 per cent in 1906. To west of Pittsburg the boat lines have only the cities on the Ohio River for delivery and show only a small proportion of the traffic.

TABLE 12.—*Movement of coal from the mines through Pittsburg, 1900–1906, showing traffic to Pittsburg district and west of Pittsburg*

[From Geological Survey, Mineral Resources of the United States]

Year.	To Pittsburg district.				To west of Pittsburg.				Total shipments.
	By rail.	By water.	Total Pittsburg district.	Per cent by water.	By rail.	By water.	Total to west of Pittsburg.	Per cent by water.	
1900		1,[illegible]				1,[illegible]			[illegible]
1901		[illegible]				1,[illegible]			[illegible]
1902	1,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]
1903	1,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1904	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1905	1,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1906	1,[illegible]	1,[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

Table 13 shows the movement of coal through the Monongahela River locks and Davis Island dam for the period 1890–1906. There has been a general increase in this traffic for the period mentioned with the exception of the year 1904. Apparently 75 per cent of river coal is consumed in the Pittsburg district, the bulk of the rest being carried to other Ohio River points.

TABLE 13—*Movement of coal through Monongahela River locks and Davis Island Dam 1890–1906*

[From Geological Survey, Mineral Resources of the United States]

Year.	Passed through locks on Monongahela River.	Passed Davis Island dam, Ohio River near Pittsburg.[a]	Difference approximate consumption of river coal at Pittsburg.
	Tons	*Tons.*	*Tons.*
1890	4,652,104	3,420,357	1,231,747
1891	4,276,588	2,893,752	1,382,836
1892	3,872,340	2,299,294	1,573,046
1893	3,860,072	2,364,401	1,495,671
1894	4,649,612	2,453,787	2,195,825
1895	4,183,596	2,393,873	1,789,723
1896	5,709,252	4,102,190	1,607,062
1897	5,289,838	2,670,369	2,619,469
1898	6,120,800	2,979,494	3,141,306
1899	5,569,967	2,709,140	2,860,827
1900	5,817,863	2,557,470	3,260,393
1901	7,945,480	3,283,353	4,662,127
1902	[b] 9,305,927	3,619,905	5,686,022
1903	9,372,664	3,069,299	6,303,365
1904	6,985,576	2,811,584	4,173,492
1905	9,484,860	3,926,319	5,558,541
1906	9,724,781	2,883,965	6,840,816

[a] From annual reports Ohio River improvements.
[b] The coal traffic on the Monongahela is obtained by adding to that which passes Lock 3, the coal mined and shipped in pools Nos. 1 and 2. In 1902 there were consumed in pools Nos. 1 and 2, 4,080,287 tons river coal; in the harbor below No. 1, including the Allegheny River, 1,605,735 tons of Monongahela River coal, a total of 5,686,022 tons.

Although the traffic on Monongahela River is largely coal, there are other commodities of importance. Table 14 shows the principal articles of traffic carried between Pittsburg and Fairmont, W. Va., for the period 1902–1907.

TABLE 14—*Traffic on Monongahela River at locks of maximum tonnage between Pittsburg and Fairmont, 1902–1907*

[From Monthly Summary of Commerce and Finance, December, 1903–1907]

Articles.	1902.[a]	1903.[a]	1904.	1905.	1906.	1907.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Bituminous coal			6,320,660	8,489,340	8,962,792	10,043,460
Sand			531,997	664,128	707,001	724,215
Gravel			522,283	737,688	981,412	1,039,415
Other articles			123,791	138,789	80,596	123,226
Total	9,586,686	10,607,738	7,498,731	10,029,945	10,731,801	11,930,316

[a] Detail statistics not available.

It will be seen that the tonnage of the entire river has increased gradually with the exception of the year 1904. The movement of gravel and sand has increased considerably and is next in importance to that of coal.

The coal traffic at Davis Island Dam also constitutes almost the *entire tonnage* at that point, while that of sand and iron and steel

manufactures follow next in importance. The following table shows the articles carried both ways during the period 1903–1907:

TABLE 15—*Traffic at Lower Island Lock, 1903–1907*

[From Monthly Summary of Commerce and Finance.]

Articles	1903	1904	1905	1906	1907
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Coal	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iron and steel manufactures	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lumber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Sand	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The production of coal in the principal districts in the State of West Virginia are shown in Table 16. The Kanawha-New River District, the Norfolk and Western District, and the Monongahela District are the larger producers in the order named.

TABLE 16—*Production of coal in West Virginia, 1904*

[From "The Coal Trade," by J. L. Stewart, 1906, pp. 17 and 18.]

District	Gross tons.
Pocahontas	[illegible]
Monongahela	[illegible]
Wheeling	[illegible]
Kanawha-New River	[illegible]
Norfolk and Western	[illegible]

The movement of coal by river and by rail at Cincinnati, Ohio, is shown in Table 17 for the period 1893–1906. Very great fluctuations occur in both the receipts and shipments, but the general tendency has been to increase. The per cent of receipts on coal hauled by river during the earlier period has been much greater than that of the later years. The average per cent for the year 1893 was 67 per cent; for 1903, 44 per cent; for 1905, 43 per cent, and for 1906, 33 per cent. Although this shows a comparatively larger haul by rail from year to year, nevertheless the traffic by river represents an approximate average of 40 per cent for most of the period.

TABLE 17—*Receipts and shipments of coal at Cincinnati, 1893–1906*

[From annual Report of the Cincinnati Chamber of Commerce.]

Year	Receipts				Shipments		
	River	Rail	Total	Per cent.	River	Rail	Total
	Bushels.	*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	*Bushels.*
1893	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1899	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1900	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1901	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1902	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1903	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1904	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The commerce passing through the Louisville and Portland Canal and the Falls of the Ohio at Louisville is shown in Table 18 for the period 1902–1907. The coal traffic constitutes almost the entire tonnage, which has had a tendency to remain normal for the period indicated.

TABLE 18—*Commerce through Louisville and Portland Canal and the Falls of Ohio River, 1902–1907*

[From Monthly Summary of Commerce and Finance]

Articles.	1902.	1903.	1904.	1905.	1906.	1907.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Coal	866,793	1,203,790	1,498,216	1,592,487	1,154,991	1,476,980
Iron ore and manufactures	13,472	24,923	34,543	43,571	35,720	25,341
Lumber	81,104	71,092	45,851	49,112	21,012	27,046
Miscellaneous merchandise	51,589	67,309	36,043	76,818	72,158	78,342
Other articles	[a] 975,831	96,720	40,959	67,171	60,023	44,690
Total	1,988,789	1,463,834	1,655,612	1,829,159	1,343,904	1,652,399

[a] Includes total tonnage of all articles over Falls of the Ohio.

TRAFFIC ON THE MISSISSIPPI

The commerce of the Mississippi, although not as great as in former years, is still of considerable importance. The river as far up as St. Louis affords good facilities for the operation of packet lines, but above that point low water frequently prevails during a large part of the year.

The following tables show the tonnage received and shipped from St. Louis via rail and river for a period of years and also shows the rivers to and from which the traffic was carried.

It will be noted on Table 19 that the tonnage received in the earlier years by river was almost double that of the latter. Shipments from the Ohio River constituted but a small proportion of the entire traffic in the earlier years given, while at the present it represents about 50 per cent of the entire river tonnage. The tonnage from the Mississippi proper has fallen off greatly.

TABLE 19—*Tonnage received at St. Louis via rail and river, 1890–1906*

[From St. Louis Merchants' Exchange Reports]

Year.	Upper Mississippi River.	Lower Mississippi River.	Illinois River.	Missouri River.	Ohio River.	Cumberland and Tennessee rivers.	Upper Mississippi River by rafts.	Total by river.	Total by rail.	Grand Total.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
1890	128,960	222,075	22,770	21,350	102,500	33,135	132,940	663,730	9,969,291	10,633,021
1891	90,865	209,095	31,190	25,065	63,890	29,945	142,090	592,140	10,008,729	10,600,869
1892	135,435	212,545	49,520	13,065	96,930	49,485	130,220	687,200	11,229,005	11,916,205
1893	111,710	216,300	50,605	8,000	93,490	52,790	126,510	599,405	10,408,039	11,007,444
1894	111,400	219,195	41,380	5,480	35,375	42,345	128,335	583,510	9,512,910	10,096,420
1895	78,170	239,000	30,000	3,270	35,440	23,575	98,685	508,830	10,489,344	10,998,174
1896	61,165	345,105	30,325	1,245	62,640	87,275	84,010	671,765	10,763,116	11,434,881
1897	51,435	311,540	38,130	250	26,915	78,835	60,565	576,670	11,921,279	12,497,949
1898	33,910	311,915	20,415	790	37,130	45,365	57,060	506,585	12,962,850	13,469,435
1899	45,410	238,140	32,585	565	39,440	38,510	71,960	466,610	14,805,872	15,272,482
1900	50,070	274,445	20,905	2,725	2,700	87,825	73,340	512,010	15,375,441	15,887,451
1901	68,470	233,885	27,395	3,860	57,315	21,330	50,550	462,805	17,433,523	17,896,328
1902	38,005	248,905	13,525	6,030	59,890	19,090	30,875	416,920	18,060,809	18,477,729
1903	32,705	160,085	12,035	1,415	111,435	18,035	4,700	340,410	21,580,403	21,920,813
1904	25,405	132,585	9,430	2,085	102,400	18,920	3,945	295,370	23,319,871	23,615,241
1905	31,190	107,520	8,725	3,580	125,755	11,870	1,210	289,850	23,915,690	24,205,540
1906	31,140	106,670	14,550	2,485	100,120	10,935	1,770	327,670	27,292,617	27,620,287

On the basis of tonnage shipped from St. Louis it will be observed that the total by river has decided stability, with an abnormal drop in 1914. The total traffic on the upper Mississippi and Illinois rivers has increased tremendously, but that on the lower Mississippi has fallen to less than 7 per cent of that in 1890.

TABLE 31—Tonnage shipped from St. Louis on the inland rivers, 1890–1914

From St. Louis Merchants' Exchange Reports

Year	Upper Mississippi River	Lower Mississippi River	Illinois River	Missouri River	Ohio River	Total upper Mississippi, Illinois, and Ohio rivers	Total lower Mississippi and Ohio rivers	Total by river	Total by rail	Grand total
	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.	Tons.
1890	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1899	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1900	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1901	[illegible]	[illegible]	[illegible]			[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1902	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1903	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1904	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

The following table shows the total river traffic at St. Louis for the period 1890–1914. The tonnage carried by steamboats and barges is still of some importance, although a considerable decrease is evident in the years 1913 and 1914. The corresponding tables for the estimated per cent of the tonnage carried by steamboats and barges. The total tonnage by river, including steamboats and barges, is a maximum for the period, and is a minimum for the years 1913 and 1914. The decrease was principally from the Upper and Lower rivers.

TABLE 32—Percentage and tonnage carried by steamboats and barges at St. Louis, 1890–1914

From St. Louis Merchants' Exchange Reports

	Percentage carried by steamboats and barges	Tonnage carried by steamboats	Percentage carried by barges	Tonnage carried by barges
	Per cent	Tons.	Per cent	Tons.
1890	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]
1892	[illegible]	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]
1899	[illegible]	[illegible]	[illegible]	[illegible]
1900	[illegible]	[illegible]	[illegible]	[illegible]
1901	[illegible]	[illegible]	[illegible]	[illegible]
1902	[illegible]	[illegible]	[illegible]	[illegible]
1903	[illegible]	[illegible]	[illegible]	[illegible]
1904	[illegible]	[illegible]	[illegible]	[illegible]
1905	[illegible]	[illegible]	[illegible]	[illegible]
1906	[illegible]	[illegible]	[illegible]	[illegible]

The receipts and shipments of grain, flour, cotton, lumber, and coal at St. Louis by the Mississippi River and by rail are shown in the following tables. It will be noted that a general decrease of river traffic in the later years is shown for all of the commodities named with the exception of that of coal received from the Ohio River. In most cases there has been a material gain for the year 1906 over that of 1905.

TABLE 22—*Receipts and shipments of grain,*[a] *via rail and river at St. Louis, 1895–1906*

[From St. Louis Merchants' Exchange Reports]

Year.	Receipts.			Shipments.			Receipts and shipments.		
	Via river.	Via rail.	Total.	Via river.	Via rail.	Total.	Via river.	Via rail.	Total.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1895	1,964,297	30,885,984	32,850,281	2,640,631	17,043,272	19,683,903	4,604,928	47,929,256	52,534,184
1896	1,555,097	49,579,247	51,134,344	11,652,027	20,791,121	32,443,148	13,207,124	70,370,368	83,577,492
1897	819,438	56,781,201	57,600,639	6,813,450	32,889,506	39,702,956	7,632,888	89,670,707	97,303,595
1898	1,327,763	52,945,452	54,273,215	7,276,668	38,317,507	45,594,175	8,604,431	91,262,959	99,867,390
1899	1,293,411	46,950,326	48,243,737	2,669,180	29,234,279	31,903,459	3,962,591	76,184,605	80,147,196
1900	1,831,503	59,313,301	61,144,804	3,943,266	39,254,806	43,198,072	5,774,769	98,568,107	104,342,876
1901	1,943,202	58,106,596	60,049,798	2,975,974	42,849,364	45,825,338	4,919,176	100,955,960	105,875,136
1902	2,408,700	68,028,372	70,437,072	3,900,041	44,704,186	48,604,227	6,308,741	112,732,558	119,041,299
1903	554,454	68,204,532	68,758,986	3,295,141	51,609,930	54,905,071	3,849,595	119,814,462	123,664,057
1904	835,431	61,505,507	62,340,938	155,355	54,796,963	54,952,318	990,786	116,302,470	117,293,256
1905	864,010	60,975,001	61,839,011	87,628	49,546,816	49,634,444	951,638	110,521,817	111,473,455
1906	866,109	79,405,510	80,271,709	136,455	60,263,917	60,400,372	1,002,654	139,669,427	140,672,081

[a] Wheat, corn, oats, barley, and rye.

TABLE 23—*Varieties of bulk grain and total of all grain shipped from St. Louis to New Orleans via Mississippi River boats, 1870–1903*

[From St. Louis Merchants' Exchange Reports]

Year.	Wheat.	Corn.	Rye.	Oats.	Total.
	Bushels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1870	66,000	.....	.....	.....	66,000
1871	.....	309,077	.....	3,000	312,077
1872	.....	1,711,039	.....	.....	1,711,039
1873	.....	1,373,969	.....	.....	1,373,969
1874	365,252	1,047,794	.....	10,000	1,423,046
1875	135,961	172,617	.....	.....	308,578
1876	37,142	1,737,237	.....	.....	1,774,379
1877	351,453	3,578,057	171,843	.....	4,101,353
1878	1,876,639	2,857,056	609,041	108,867	5,451,603
1879	2,390,897	3,585,589	157,424	30,928	6,164,838
1880	5,913,272	9,804,392	45,000	.....	15,762,664
1881	4,197,981	8,640,720	22,423	132,823	12,993,947
1882	5,637,391	2,529,712	15,994	150,320	8,333,417
1883	1,435,043	9,029,509	205,430	389,826	11,059,808
1884	1,318,688	4,496,785	344,864	487,221	6,647,558
1885	50,000	8,180,039	36,093	401,787	8,667,919
1886	743,439	7,501,730	.....	508,755	8,834,924
1887	3,973,737	7,365,340	.....	217,722	11,556,799
1888	1,247,952	5,844,042	.....	160,584	7,252,578
1889	1,651,950	12,398,955	17,432	89,707	14,158,044
1890	1,409,440	8,717,849	.....	89,960	10,217,249
1891	6,940,215	1,482,731	45,600	.....	8,468,546
1892	5,149,708	3,228,645	.....	36,587	8,414,940
1893	3,710,360	3,293,808	.....	75,430	7,079,598
1894	1,042,193	1,263,310	.....	40,000	2,345,503
1895	483,611	1,251,803	.....	.....	1,735,417
1896	1,732,563	8,358,087	.....	436,558	10,527,208
1897	1,191,032	3,827,963	190,968	265,379	5,475,342
1898	2,747,998	3,006,488	212,720	633,505	6,600,707
1899	234,720	1,748,517	.....	249,998	2,233,235
1900	169,241	2,871,870	.....	273,049	3,314,160
1901	1,828,244	535,705	.....	.....	2,363,949
1902	2,308,714	226,400	28,212	28,409	2,591,735
1903	1,724,220	1,025,221	.....	.....	2,749,441

TABLE 15—Receipts and shipments of four principal articles at St. Louis

[From St. Louis Merchants' Exchange Reports]

Year	Receipts			Shipments			Receipts and shipments		
	By river	By rail	Total	By river	By rail	Total	By river	By rail	Total
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1880	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1881	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1882	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1883	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1884	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1885	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1886	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1888	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 16—Receipts of grain at St. Louis

[From St. Louis Merchants' Exchange Reports]

Year	By river Mississippi River ports	By railroad and Tennessee River ports	Total river	Total rail	Grand total river and rail
	Bushels.	Bushels.	Bushels.	Bushels.	Bushels.
1880–81	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1881–82	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1882–83	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1883–84	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1884–85	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1885–86	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1886–87	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887–88	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1888–89	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889–90	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890–91	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891–92	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892–93	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893–94	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894–95	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895–96	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE [illegible]—Receipts of [illegible] at St. Louis [illegible] 1892–1896

[From St. Louis Merchants' Exchange Reports]

	1892	1893	1894	1895	1896
By rail	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
By river					
Lumber	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Hinges	[illegible]	[illegible]	[illegible]		
Nails	[illegible]	[illegible]		[illegible]	
Pulleys	[illegible]	[illegible]			
Logs	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 27—*Shipments of lumber from St. Louis via rail and river, 1902–1906*

[St. Louis Merchants' Exchange Reports]

	1902.	1903.	1904.	1905.	1906.
By rail.....cars..	71,727	81,572	76,101	85,988	97,441
By river.....feet..	2,086,000	1,836,000	(a)	1,435,000	1,841,000

a Shipments for 1904 not available.

TABLE 28—*Receipts of coal at St. Louis via Ohio River, 1902–1906*

[St. Louis Merchants' Exchange Reports]

Year.	Tons.
1902	58,500
1903	107,680
1904	101,200
1905	125,755
1906	160,120

Below are embodied a series of tables showing the receipts and exports of grain at New Orleans and the movement of river traffic in the same commodities:

TABLE 29—*Receipts and exports of grain at New Orleans, 1873–1907*

[From monthly summary of commerce and finance, 1900, and from annual report New Orleans Board of Trade, 1906]

Year.	Flour.		Wheat.		Corn.		Oats.	
	Received.	Exported.	Received.	Exported.	Received.	Exported.	Received.	Exported.
	Barrels.	*Barrels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1873	1,046,024	54,006	896	.....	6,097,522	946,457	2,267,596	22,228
1874	1,001,504	176,745	325,287	265,788	5,080,402	1,244,963	1,868,840	56,081
1875	864,242	74,219	145,485	206,399	3,465,909	197,433	1,727,232	18,025
1876	791,701	93,792	82,812	37,102	4,202,022	1,639,756	1,166,432	25,002
1877	631,602	34,208	110,561	105,271	5,580,150	2,824,921	1,169,524	.....
1878	639,304	38,082	1,048,857	838,088	7,996,361	6,025,664	1,687,436	2,800
1879	619,461	40,230	3,128,914	2,796,669	7,023,191	3,909,589	1,780,872	3,220
1880	626,418	102,361	5,169,497	5,344,510	11,177,045	9,205,984	1,139,852	4,890
1881	642,460	60,843	6,707,982	4,420,614	11,508,685	7,797,557	1,598,180	449
1882	729,749	66,119	2,890,698	6,100,233	4,024,325	245,987	1,490,254	5,047
1883	726,291	83,935	2,372,430	7,089,361	10,853,264	6,378,158	1,560,353	8,278
1884	692,303	35,572	1,551,591	648,337	6,092,398	6,051,507	1,728,559	3,442
1885	602,609	25,430	95,906	1,590,124	8,059,486	6,644,639	417,880	1,583
1886	694,263	24,832	1,039,466	30,702	8,195,998	8,553,913	439,633	11,121
1887	624,852	54,125	4,368,951	4,345,553	8,352,999	7,505,816	1,320,152	2,186
1888	671,331	43,152	1,484,951	1,566,297	7,001,185	4,949,723	523,740	1,478
1889	675,924	31,646	1,583,385	960,949	14,933,398	11,812,859	1,170,582	358
1890	640,373	44,276	1,593,275	1,523,014	13,780,264	12,028,362	3,320,225	26,434
1891	652,873	52,015	10,604,450	10,336,186	3,354,773	1,912,173	3,442,420	1,891
1892	842,064	225,841	14,592,156	14,207,443	7,501,128	7,379,678	4,459,495	9,103
1893	766,252	117,878	13,181,944	12,896,734	7,611,607	6,506,333	3,495,630	122,533
1894	756,068	133,075	2,390,353	2,925,541	4,381,173	5,441,448	2,204,820	12,712
1895	655,291	91,140	868,944	836,202	9,927,676	8,756,706	3,018,241	23,790
1896	547,525	268,154	3,852,623	3,853,337	25,989,094	25,292,502	3,046,315	262,143
1897	516,310	345,017	10,642,166	10,356,248	27,559,482	27,714,472	3,799,972	1,294,518
1898	747,879	295,472	12,657,877	12,795,542	19,748,497	20,735,569	4,265,955	1,662,956
1899	734,027	462,462	11,874,589	11,562,812	22,041,796	21,939,586	3,563,115	923,729
1900	647,796	378,306	7,440,472	8,055,397	23,292,659	23,403,453	4,972,067	1,569,192
1901	535,371	571,209	24,796,841	24,485,807	11,904,615	12,471,703	4,902,106	1,995,409
1902	561,147	530,162	17,250,250	16,505,284	2,791,633	2,074,917	2,522,891	180,521
1903	528,471	1,162,719	11,218,975	11,897,486	12,756,740	12,998,439	4,067,254	35,581
1904	505,428	660,129	1,737,015	2,089,814	4,580,357	5,309,214	2,435,875	43,200
1905	497,143	783,108	809,600	584,334	25,652,020	21,937,952	2,309,000	894,143
1906	620,577	1,219,867	5,473,800	5,675,853	19,339,812	17,337,450	6,497,145	5,417,779
1907	766,218	855,808	5,318,200	5,181,165	9,051,000	8,402,993	4,627,500	1,964,639

TABLE 30.—*Receipts of flour and grain at New Orleans via rail and river, 1897, 1898.*

[From Monthly Summary of Commerce and Finance, 1898.]

		1897.	1898.			1897.	1898.
Flour:				Wheat:			
Rail	barrels	177,298	499,492	Rail	bushels	1,882,956	4,771,104
River	do	563,172	39,377	River	do	2,469,112	2,966,791
Total	do	740,364	538,869	Total	do	10,342,468	12,457,457
Corn:				Rye:			
Rail	bushels	23,149,322	24,722,147	Rail	do	.....	27,300
River	do	4,722,723	1,825,330	River	do	369,270	265,182
Total	do	27,872,045	26,547,477	Total	do	369,270	292,482
Oats:							
Rail	do	2,494,494	1,291,459				
River	do	2,251,951	2,174,407				
Total	do	4,746,434	4,265,866				

TABLE 31.—*Grain shipments from St. Louis and grain movements at New Orleans, 1882–1898.*

[Compiled from reports of New York Produce Exchange.]

Year.	Shipments from St. Louis by river.	Total receipts at New Orleans.	Exports from New Orleans.	Year.	Shipments from St. Louis by river.	Total receipts at New Orleans.	Exports from New Orleans.
	Bushels.	*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	*Bushels.*
1869	.....	4,540,814	.....	1889	7,252,579	9,[illegible],978	4,785,192
1869	.....	1,173,451	.....	1889	14,559,144	17,771,381	14,342,[illegible]
1871	44,[illegible]	7,272,794	.....	1890	21,217,140	24,[illegible],714	12,772,221
1872	112,177	4,695,117	.....	1891	4,469,548	7,[illegible],771,[illegible]	12,564,[illegible]
1872	1,[illegible],139	1,419,365	.....	1892	4,413,210	31,[illegible],[illegible]	27,[illegible],354
1873	1,[illegible],169	4,[illegible],108	1,[illegible],173	1893	7,179,[illegible]	34,[illegible],[illegible]	19,[illegible],[illegible]
1874	1,[illegible],156	7,297,[illegible]	1,[illegible],711	1894	1,145,518	4,[illegible],[illegible]	4,179,711
1875	319,[illegible]	1,149,196	415,452	1895	1,736,[illegible]	13,[illegible],[illegible]	4,[illegible],[illegible]
1876	1,[illegible],177	1,595,[illegible]	1,[illegible],[illegible]	1896	11,[illegible],[illegible]	32,[illegible],[illegible]	33,425,[illegible]
1877	4,311,[illegible]	4,967,[illegible]	3,[illegible],[illegible]	1897	1,[illegible],[illegible]	42,271,[illegible]	38,[illegible],[illegible]
1878	1,[illegible],[illegible]	[illegible],794	7,[illegible],[illegible]	1898	1,[illegible],717	34,[illegible],[illegible]	35,[illegible],[illegible]
1879	4,[illegible],[illegible]	11,[illegible],[illegible]	4,[illegible],[illegible]	1899	1,[illegible],[illegible]	17,[illegible],[illegible]	34,[illegible],[illegible]
1880	11,[illegible],[illegible]	17,[illegible],[illegible]	1,[illegible],[illegible]	1900	1,[illegible],[illegible]	15,[illegible],[illegible]	22,[illegible],[illegible]
1881	11,[illegible],[illegible]	21,[illegible],[illegible]	11,[illegible],[illegible]	1901	1,[illegible],[illegible]	41,[illegible],[illegible]	29,[illegible],[illegible]
1882	4,[illegible],[illegible]	4,[illegible],[illegible]	1,[illegible],[illegible]	1902	1,[illegible],[illegible]	22,[illegible],[illegible]	18,[illegible],[illegible]
1883	11,[illegible],[illegible]	11,[illegible],[illegible]	11,[illegible],[illegible]	1903	1,[illegible],[illegible]	29,[illegible],[illegible]	35,[illegible],[illegible]
1884	1,[illegible],[illegible]	1,[illegible],[illegible]	1,[illegible],[illegible]	1904	.....	4,[illegible],[illegible]	4,[illegible],[illegible]
1885	4,[illegible],[illegible]	4,[illegible],[illegible]	7,[illegible],[illegible]	1905	.....	29,[illegible],[illegible]	22,[illegible],[illegible]
1886	4,[illegible],[illegible]	1,[illegible],[illegible]	1,[illegible],[illegible]	1906	.....	11,[illegible],[illegible]	27,[illegible],[illegible]
1887	11,[illegible],[illegible]	14,[illegible],[illegible]	11,[illegible],[illegible]				

TRAFFIC ON VARIOUS RIVERS AND CANALS

The following is a table of traffic on some of the smaller rivers and canals throughout the country. There has been a general increase on most of the rivers from year to year. There has also been a material gain for the year 1907 over both 1905 and 1906, the traffic aggregating 2,955,444 tons for the routes named.

TABLE 32—*Freight transported on various rivers and canals, 1902–1907*

[From Monthly Summary of Commerce and Finance]

Rivers and canals.	1902.	1903.	1904.	1905.	1906.	1907.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
Barren River, Ky., Lock 1	41,231	36,949	39,945	52,432	35,583	38,526
Big Sandy River, Ky., and W. Va., Lock 3 or 2	251,911	289,499	305,892	146,413	241,409	174,587
Black Warrior River, Ala., Lock 12 (formerly 3)	16,105	32,134	14,625	12,530	15,150	20,340
Canal at the Cascades, Oreg	25,308	37,848	33,173	41,390	48,305	65,934
Coosa River, Ala., Lock 2 or Lock 3	3,226	2,106	576	2,584	2,815	1,612
Cumberland River, Tenn., Lock A	.....	.....	.....	87,382	63,379	79,415
Des Moines Rapids Canal	55,781	34,815	47,440	20,895	34,447	23,994
Green River, Ky., Lock 1	392,847	450,739	374,853	400,120	375,919	424,776
Kanawha River, Great Lock 11	977,101	.....	.....	1,511,872	1,208,023	1,725,525
Kanawha River, Little Lock 5	69,706	.....	.....	106,520	142,006	108,756
Kentucky River, Ky., Lock 4	48,665	101,801	102,129	134,324	144,255	191,311
Muscle Shoals Canal, Tenn	7,188	9,691	10,562	17,796	26,878	21,101
Muskingum River, Ohio, Lock 1	37,380	58,264	29,351	38,070	27,872	42,828
Rough River, Ky., Lock 1	25,977	34,390	35,446	59,696	34,112	28,754
Wabash River, Ind., Lock 1	1,594	1,771	1,662	6,014	5,597	6,312
Yamhill Lock, Oreg	1,718	997	3,394	2,785	3,304	1,673

NAVIGATION ON THE COLORADO

In a letter to the Bureau of Corporations, dated January 30, 1907, Mr. J. A. Mellon, master of the steamer *Cochan*, operating on the Colorado River, gives the following brief history of transportation on that stream:

In the year 1851 it became necessary for the United States to establish a military post at Yuma. The troops marched from San Diego. To supply the troops by the desert route was found impossible and a contract was let by the quartermaster to G. A. Johnson to transport 75 tons by water from San Francisco to Yuma. Johnson shipped the stores on the schooner *Sierra Nevada* to the mouth of the Colorado, with lumber enough on deck to build flat boats for the river transportation, and with the same he cordelled the freight to Yuma, making a successful trip. The next contract let was for 100 tons, and a man by the name of Turnbull was the successful bidder. He shipped the goods to the mouth of the river on the *Invincible*, and with material for building a small boat, which he named the *Uncle Sam*. His boat did not have power enough to stem the current of the Colorado. When he reached a point 50 miles from Yuma he landed his freight and from there it was hauled to Yuma by teams. The charge for hauling it was so great that it broke Turnbull. The next contract was awarded to George A. Johnson, and he built a steamer which he named the *General Jessup*. Johnson formed an association with Ben Hartshorn and another man of the name of Mintron, and the firm was known from that time (1853) until the year 1871 by the name of G. A. Johnson & Co. Their agent in San Francisco was George F. Hooper, who was also sutler at Yuma from 1853 until the Southern Pacific Railroad reached Yuma in April, 1877. George A. Johnson was connected with the transportation of all Government and all other stores from San Francisco to El Dorado Canyon, on the Colorado River. The river route was 525 miles and the sea route was 1,950 miles by the Pacific and Gulf of California. In 1871 G. A. Johnson & Co. incorporated under the name of the Colorado Steam Navigation Company and put

on the steamships *Newbern* and *Monomai* to connect with the river boats. These ships made a trip from San Francisco every twenty days to the mouth of the river. Previous to 1877 freight was received on the river boats from sailing vessels, with an occasional steamship when there was a rush of Government supplies and troops.

Civilian freight first became a factor on the Colorado River in 1859 when the Gila placer mines were struck, and from that time until the Southern Pacific Railroad reached Yuma there was a steady increase in river trade.

Mr. Mellon estimates that there were 110 men employed on the boats and barges and in the shipyards on the river, belonging to the Colorado Steam Navigation Company. He continues:

When the railroad reached a point 30 miles from Yuma in March, 1877, the P. I. Company, a branch of the Southern Pacific Railroad, bought out the Colorado Steam Navigation Company, and from that year until 1896 the P. I. Company ran the river boats in connection with the Southern Pacific Railroad. In September, 1896, the P. I. Company sold their interests to Pilkington & Mellon, who controlled the trade until 1901, in which time Pilkington withdrew, and at present the transportation is controlled by Joe J. Thornton, J. A. Mellon, John Gandolfo, Frank Monaghan, and Dan Murphy. They own the steamer *Cochan* and the barge *Silas J. Lewis*. The *Cochan* is 207 tons custom-house measure. She is 157 feet over all and 32 feet beam, and draws 30 inches of water when light, and for every 10 tons of freight requires 1 inch of water. The barge *Silas J. Lewis* is 150 feet over all, 32 feet beam, 4 feet deep. She measures 100 tons, draws 7 inches without load, and carries 11 tons to every inch you sink her in the water, or 175 tons in a draft of 2 feet. We are not incorporated, although we work under the name of the Colorado Steam Navigation Company, the reason for which is that I have been on the boats constantly since 1881, first with G. A. Johnson & Co., then with the Colorado Steam Navigation Company, then with the P. I. Company, which still retains the name of the Colorado Steam Navigation Company, and when Pilkington and I bought out the boats we continued to call it the Colorado Steam Navigation and so down to the present time.

Mr. Mellon states that the profits of his company are far less now than before the advent of the railroad into Arizona. He states that the *Cochan* was built in 1899 at a cost of $20,000, starting on her first run January 7, 1900. The barge *Silas J. Lewis* was, according to his statement, launched September 29, 1901. Referring to the subject of competing boat lines, Mr. Mellon writes that the first competitive boat put on the Colorado was in 1864, the name of the vessel being *Esmeralda* and her owner Thomas E. Trueworthy. Owing to Trueworthy's ignorance of navigating the Colorado she went to the wall and, according to the statement of Mr. Mellon, was sold to G. A. Johnson & Co. for a nominal sum. Mr. Mellon writes that the next competitive boat was the *Mineralder* in 1868, which appears to have gone the same way as the *Esmeralda*. No further competition appears to have been encountered until 1901, when the Mexican-Colorado Navigation Company was formed in Los Angeles, Cal. In reference to this organization Mr. Mellon, in his letter, makes the following statement:

They Mexican-Colorado Navigation Company put on a small boat called the *Sultana*. She is 75 feet in length and she lasted in the hands of the sheriff for a year.

Mr. Mellon, in his letter, thus summarizes the history of vessel building on the Colorado River:

TABLE 33—*Vessels on Colorado River*

Name.	Class.	When built.	Name.	Class.	When built.
Uncle Sam	Steamer	1852	Mohave No. 2	Steamer	1876
General Jessup	do	1853	Mohave No. 3	do	1884
Colorado No. 1	do	1856	Cochan	do	1899
Explorer Lieut. J. C. Ives (Government boat).	do	1857	St. Vallier (iron)	do	1898
			Searchlight	do	1903
Cocopah No. 1	do	1858	No. 1	Barge	1864
Colorado No. 2	do	1862	No. 2	do	1866
Mohave No. 1	do	1864	No. 3	do	1867
Esmeralda	do	1864	No. 4	do	1872
Ninatilden (built in San Francisco).	do	1865	Black Crook	do	1864
			White Swan	do	1868
Cocopah No. 2	do	1867	Silas J. Lewis	do	1901
Gila	do	1872			

Referring to the subject of barges, Mr. Mellon writes that all of these except the *Silas J. Lewis* were rebuilt a number of times. He ends his letter with this statement:

I have come to the conclusion that any river that has over 4 feet fall to the mile can not compete with a railroad for freight or passengers.

3. STATISTICS OF COMMERCE ON THE GREAT LAKES

TOTAL TRAFFIC ON THE GREAT LAKES

A summary of lake traffic at United States ports for the years 1905–1907 is given in the following tables. The various quantities and units of freight are reduced to their equivalents in net tons.

The principal commodities moved on the Great Lakes and the per cent which each bears to the total traffic, as shown in tables 34 and 35, are as follows: Iron ore, 54.4 per cent to 56.5 per cent; coal, 19.8 per cent to 25.8 per cent; wheat, flour, and grain, 6.1 per cent to 7 per cent, and lumber and logs, 3.7 per cent to 6.6 per cent. There has been a marked increase for the total movement since 1905, the increase for 1907 over that year for both receipts and shipments being 24 per cent.

TABLE 34—*Domestic shipments on Great Lakes, 1905–1907*

[From Monthly Summary of Commerce and Finance, December, 1905, pp. 1908–1913; December, 1906, pp. 1295–1299; December, 1907, pp. 1165–1169]

[Net tons, thousands]

Articles.	1905.	1906.	1907.
Coal	14,666	17,575	21,525
Flour	1,257	1,335	1,315
Wheat [a]	1,020	1,432	1,900
Grain other than wheat [b]	2,409	2,258	1,960
Manufactured and pig iron [c]	775	1,035	787
Salt	565	568	558
Copper [c]	135	131	119
Iron ore [c]	36,621	41,297	45,615
Lumber and logs	4,269	3,993	[d] 2,761
Unclassified freight [e]	5,629	5,986	6,697
Total	67,346	75,610	83,507

PERCENTAGE OF TOTAL SHIPMENTS

Coal	21.8	23.2	25.8
Flour	1.9	1.8	1.6
Wheat	1.5	1.9	2.3
Grain other than wheat	3.6	3.0	2.4
Manufactured and pig iron	1.1	1.4	.9
Salt	.8	.7	.7
Copper	.2	.2	.1
Iron ore	54.4	54.6	54.6
Lumber and logs	6.3	5.3	3.3
Unclassified freight	8.4	7.9	8.3

[a] Converted from bushels on basis 1 bushel equals 60 pounds.
[b] Converted from bushels on basis 1 bushel corn equals 56 pounds; 1 bushel oats equals 32 pounds; 1 bushel barley equals 48 pounds; 1 bushel rye equals 56 pounds.
[c] Converted from gross to net tons.
[d] Logs included in unclassified freight.
[e] Includes flaxseed converted from bushels on basis 1 bushel equals 56 pounds.

TABLE 35—*Domestic receipts on Great Lakes, 1905–1907*

[From Monthly Summary of Commerce and Finance, December, 1905, pp. 1908–1913; December, 1906, pp. 1295–1299; December, 1907, pp. 1165–1167]

[Net tons, thousands]

Articles.	1905.	1906.	1907.
Coal	12,914	15,533	19,468
Flour	1,247	1,338	1,314
Wheat [a]	1,028	1,469	1,874
Grain other than wheat [b]	2,158	2,004	1,776
Manufactured and pig iron [c]	729	1,044	778
Salt	548	555	560
Copper [c]	133	140	118
Iron ore [c]	36,609	41,319	45,572
Lumber and logs	4,317	3,852	3,013
Unclassified freight [d]	5,712	5,934	6,651
Total	65,395	73,178	81,124
PERCENTAGE OF TOTAL RECEIPTS			
Coal	19.8	21.2	24.0
Flour	1.9	1.8	1.6
Wheat	1.6	2.0	2.3
Grain other than wheat	3.3	2.7	2.2
Manufactured and pig iron	1.1	1.4	1.0
Salt	.8	.8	.7
Copper	.2	.2	.1
Iron ore	56.0	56.5	56.2
Lumber and logs	6.6	5.3	3.7
Unclassified freight	8.7	8.1	8.2

[a] Converted from bushels on basis 1 bushel equals 60 pounds.
[b] Converted from bushels on basis 1 bushel barley equals 48 pounds; 1 bushel oats equals 32 pounds; 1 bushel corn equals 56 pounds; 1 bushel rye equals 56 pounds.
[c] Converted from gross to net tons.
[d] Includes flaxseed converted from bushels on basis 1 bushel equals 56 pounds.

TRAFFIC THROUGH ST. MARYS FALLS CANALS.

Below is a summary of lake traffic passing through the St. Marys Falls Canals and the per cent of each commodity to the total tonnage for the period 1901–1907.

TABLE 36—*Traffic through St. Marys Falls Canals, 1901–1907*

[From Monthly Summary of Commerce and Finance, 1902–1907]

[Net tons, thousands]

Articles.	1901.	1902.	1903.	1904.	1905.	1906.	1907.
Coal	4,593	4,812	6,938	6,455	6,509	8,740	11,400
Flour	763	891	709	471	577	649	652
Wheat [a]	1,584	2,302	1,841	1,498	2,050	2,528	2,944
Grain, other than wheat [b]	594	606	770	793	941	1,304	1,043
Manufactured and pig iron	206	198	193	230	238	391	308
Salt	62	62	64	51	59	66	65
Copper	99	121	113	110	106	108	90
Iron ore	18,091	24,277	21,655	19,636	31,333	35,357	39,595
Lumber [c]	1,806	1,853	1,710	1,542	1,610	1,467	1,097
Unclassified freight	605	779	681	760	848	1,141	1,023
Total	28,403	35,961	34,674	31,546	44,271	51,751	58,217
PERCENTAGE OF TOTAL FREIGHT							
Coal	16.2	13.4	20.0	20.5	14.7	16.9	19.5
Flour	2.7	2.5	2.0	1.5	1.3	1.3	1.1
Wheat	5.6	6.4	5.3	4.8	4.6	4.9	5.0
Grain, other than wheat	2.1	1.9	2.2	2.5	2.1	2.5	1.8
Manufactured and pig iron	.7	.5	.6	.7	.5	.8	.5
Salt	.2	.2	.2	.2	.1	.1	.1
Copper	.3	.3	.3	.3	.3	.2	.1
Iron ore	63.7	67.5	62.5	62.2	70.8	68.3	68.2
Lumber	6.4	5.1	4.9	4.9	3.7	2.8	1.9
Unclassified freight	2.1	2.2	2.0	2.4	1.9	2.2	1.8

[a] Converted from bushels on basis 1 bushel equals 60 pounds.
[b] Converted from bushels on basis 1 bushel equals 48 pounds.
[c] Difference between other listed articles and total freight.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

TABLE [illegible]—Comparison of domestic traffic on Great Lakes and total traffic through St. Marys Falls Canal, 1896–1907

[illegible]

(Net tons thousands)

[illegible]	1896			1906			1907		
	Total domestic traffic	Traffic through St. Marys Falls Canal	Per cent St. Marys Falls Canal is of total	Total domestic traffic	Traffic through St. Marys Falls Canal	Per cent St. Marys Falls Canal is of total	Total domestic traffic	Traffic through St. Marys Falls Canal	Per cent St. Marys Falls Canal is of total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wheat	[illegible]	[illegible]		[illegible]	[illegible]		[illegible]	[illegible]	
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TABLE 38—*Vessel movement through St. Marys Falls Canals, 1881–1907*

[From Monthly Summary of Commerce and Finance, December, 1907, p. 1176]

Years.	Date of opening canal.	Date of closing canal.	Tonnage and class of vessels.					Passengers.
			Sailing vessels.	Steamers.	Unregistered craft.	Total passages.	Registered tonnage.	
			Number.	*Number.*	*Number.*	*Number.*	*Net tons.*	*Number.*
1881	May 7	Dec. 5	1,706	2,117	181	4,004	2,092,757	24,671
1882	Apr. 21	Dec. 3	1,663	2,739	372	4,774	2,468,088	29,256
1883	May 2	Dec. 11	1,458	2,620	237	4,315	2,042,259	39,130
1884	Apr. 23	Dec. 10	1,709	3,609	371	5,689	2,997,837	54,214
1885	May 6	Dec. 2	1,689	3,354	337	5,380	3,035,937	36,147
1886	Apr. 25	Dec. 4	2,534	4,584	306	7,424	4,219,397	27,088
1887	May 1	Dec. 2	2,562	5,968	825	9,355	4,897,598	32,668
1888	May 7	Dec. 4	2,009	5,305	489	7,803	5,130,659	25,558
1889	Apr. 15	....do...	2,635	6,501	443	9,579	7,221,935	25,712
1890	Apr. 20	Dec. 3	2,872	7,268	417	10,557	8,454,435	24,856
1891	Apr. 27	Dec. 7	2,405	7,339	447	10,191	8,400,685	26,190
1892	Apr. 18	Dec. 6	3,324	8,737	519	12,580	10,647,203	25,896
1893	May 1	Dec. 5	2,955	8,379	674	12,008	8,949,754	18,869
1894	Apr. 17	Dec. 6	3,676	10,208	607	14,491	13,110,366	27,236
1895 [a]	Apr. 25	Dec. 11	4,790	12,495	671	17,956	16,806,781	31,656
1896	Apr. 21	Dec. 8	4,391	13,404	820	18,615	17,249,418	37,066
1897	....do...	Dec. 14	4,438	12,029	704	17,171	17,619,933	40,213
1898	Apr. 11	....do...	4,449	12,461	851	17,761	18,622,754	43,426
1899	Apr. 26	Dec. 20	4,776	14,378	1,101	20,255	21,958,347	49,082
1900	Apr. 19	Dec. 16	4,004	14,426	1,022	19,452	22,315,834	58,555
1901	Apr. 20	Dec. 21	4,482	14,372	1,187	20,041	24,626,976	59,663
1902	Apr. 1	Dec. 20	4,368	17,069	1,222	22,659	31,255,582	59,377
1903	Apr. 2	Dec. 15	3,569	14,027	1,000	18,596	27 736,444	55,175
1904 [b]	May 5	Dec. 13	2,994	12,188	938	16,120	24,364,138	37,695
1905 [b]	Apr. 14	Dec. 16	3,263	17,197	1,219	21,679	36,617,699	54,204
1906 [b]	Apr. 13	Dec. 17	2,817	18,138	1,200	22,155	41,098,324	63,033
1907 [b]	....do...	Dec. 11	2,303	17,245	889	20,437	44,087,974	62,758

[a] From 1895 figures include traffic through Canadian canal, opened to commerce Sept. 9, 1895.
[b] In 1904, 1905, 1906, and 1907 the dates of opening and closing are for American locks.

The traffic through the St. Marys Falls canals is further outlined in tables 39 and 40. There has been a steady increase in the tonnage throughout the entire period, except in 1891 and 1893 and in 1903 and 1904, when the ore tonnage fell heavily. The importance of this commodity in the movement of lake tonnage is a most vital one. During the earlier years, flour, wheat, other grain, and lumber were more important in the movement of commerce.

TABLE 30.—Traffic through St. Marys Falls Canals, 1887–1907.

(From Monthly Summary of Commerce and Finance, December, 1907, pp. 1130–1137.)

Year	Date of opening canal	Date of closing canal	Coal	Flour	Wheat	Grain other than wheat	Manufactured iron and pig iron	Salt	Copper	Iron ore	Lumber	Silver ore and bullion	Building stone	Unclassified freight	Total freight
			Net tons	Barrels	Bushels	Bushels	Net tons	Barrels	Net tons	Net tons	M. feet	Net tons	Net tons	Net tons	Net tons
1887	May	Dec. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1888	Apr. 21	Dec. 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889	May 3	Dec. 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890	Apr. 21	Dec. 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	May 8	Dec. 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892	Apr. 23	Dec. 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893	May 1	Dec. 3	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	May 7	Dec. 4	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	Apr. 13	do.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	Apr. 30	Dec. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1897	Apr. 27	Dec. 2	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	Apr. 12	Dec. 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1899	May 1	Dec. 1	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1900	Apr. 17	Dec. 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1901	Apr. 24	Dec. 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1902	Apr. 21	Dec. 9	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1903	do.	Dec. 14	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1904	Apr. 11	do.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1905	Apr. 30	Dec. 21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1906	Apr. 19	Dec. 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1907	Apr. 20	Dec. 21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1908	Apr. 1	Dec. 21	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1909	Apr. 3	Dec. 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1910	May 3	Dec. 13	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1911	Apr. 14	Dec. 10	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1912	Apr. 13	Dec. 17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]
1907	do.	Dec. 11	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	[illegible]

* From 1887 figures include traffic through Canadian canal, opened for commerce September 9, 1895.
* In 1904, 1905, 1906, and 1907 the dates of opening and closing are for American locks.

TABLE 40—*Tonnage through St. Marys Falls Canals, 1881–1907*

[Compiled from Table 39]

[All figures in tons]

Year.	Date of opening canal.	Date of closing canal.	Commodities.												Total of all freight except lumber.	Total freight.
			Coal.	Flour.[b]	Wheat.[c]	Grain other than wheat.[d]	Manufactured and pig iron.	Salt.[e]	Copper.	Iron ore.	Lumber.[f]	Silver ore and bullion.	Building stone.	Unclassified freight.		
1881	May 7	Dec. 5	295,647	60,545	103,709	8,828	87,830	9,226	29,488	748,131	93,906	.....	1,400	129,031	1,473,835	1,567,741
1882	Apr. 21	Dec. 3	430,184	34,404	111,866	11,355	92,870	24,726	25,409	987,060	134,030	22	5,428	172,167	1,895,491	2,029,521
1883	May 2	Dec. 11	714,444	68,703	177,014	18,637	109,910	9,926	31,024	791,732	150,925	814	2,405	191,571	2,116,180	2,267,105
1884	Apr. 23	Dec. 10	706,379	124,824	359,574	12,410	72,428	20,273	36,062	1,136,071	183,585	9,731	6,047	207,173	2,690,972	2,874,557
1885	May 6	Dec. 2	894,991	144,009	458,226	10,152	60,842	19,090	31,927	1,235,122	205,448	3,669	8,189	184,963	3,051,180	3,256,628
1886	Apr. 25	Dec. 4	1,009,999	175,937	569,745	17,169	115,208	22,215	38,627	2,087,809	248,866	2,009	9,449	230,726	4,278,893	4,527,759
1887	May 1	Dec. 2	1,352,987	157,274	692,896	18,604	74,919	28,687	34,886	2,497,713	278,346	350	13,401	344,586	5,216,303	5,494,649
1888	May 7	Dec. 4	2,105,041	219,073	557,891	48,535	63,703	29,461	28,960	2,570,517	405,462	3,385	33,541	345,854	6,005,961	6,411,423
1889	Apr. 15	....do...	1,629,197	222,871	486,956	51,198	57,561	23,555	33,456	4,095,855	563,478	5,947	33,538	312,410	6,952,544	7,516,022
1890	Apr. 20	Dec. 3	2,176,925	323,910	486,521	49,065	116,327	25,120	43,729	4,774,768	622,149	3,432	47,973	371,294	8,419,064	9,041,213
1891	Apr. 27	Dec. 7	2,507,532	378,014	1,164,497	24,770	69,741	32,834	69,190	3,560,213	619,064	1,731	44,080	417,093	8,269,695	8,888,759
1892	Apr. 18	Dec. 6	2,904,266	541,814	1,229,843	40,001	101,530	38,604	64,993	4,901,132	891,386	1,930	39,698	459,146	10,322,947	11,214,333
1893	May 1	Dec. 5	3,008,120	742,067	1,304,450	57,728	89,452	32,022	87,530	4,010,556	1,027,571	2,470	19,426	415,180	9,769,001	10,796,572
1894	Apr. 17	Dec. 6	2,797,184	896,577	1,046,084	37,080	60,659	33,245	99,573	6,548,876	1,203,568	412	21,417	451,185	11,992,292	13,195,860
1895[a]	Apr. 25	Dec. 11	2,574,362	890,230	1,386,548	199,889	100,337	37,789	107,452	8,062,209	1,216,480	100	23,876	463,308	13,846,100	15,062,580
1896	Apr. 21	Dec. 8	3,023,340	888,286	1,897,694	658,754	121,872	33,252	116,872	7,909,250	1,050,919	240	17,731	520,851	15,188,142	16,239,061
1897	....do...	Dec. 14	3,039,172	892,114	1,677,729	597,353	135,164	39,963	122,324	10,633,715	1,259,919	5	6,249	579,048	17,722,836	18,982,755
1898	Apr. 11	....do...	3,776,450	777,804	1,870,200	625,881	250,170	42,218	124,226	11,706,960	1,432,939	.....	4,670	623,146	19,801,725	21,234,664
1899	Apr. 26	Dec. 20	3,940,887	711,415	1,751,920	720,022	214,585	44,287	120,090	15,328,240	1,797,330	487	39,063	587,484	23,458,480	25,255,810
1900	Apr. 19	Dec. 16	4,486,977	676,069	1,214,679	388,192	135,585	46,045	131,066	16,443,568	1,530,483	110	48,902	541,397	24,112,590	25,643,073
1901	Apr. 20	Dec. 21	4,593,136	763,435	1,584,379	594,253	206,443	62,128	98,601	18,090,618	1,805,447	.....	46,584	558,041	26,597,618	28,403,065
1902	Apr. 1	Dec. 20	4,812,478	891,024	2,301,929	665,780	198,152	62,063	120,612	24,277,555	1,852,533	1	38,919	740,100	34,108,613	35,961,146
1903	Apr. 2	Dec. 15	6,937,633	709,338	1,841,537	770,296	193,267	63,683	112,877	21,654,898	1,709,769	.....	21,300	659,839	32,964,668	34,674,437
1904	May 5	Dec. 13	6,454,869	471,054	1,497,866	792,744	229,985	51,164	109,605	19,635,797	1,542,564	1,356	27,093	732,009	30,003,542	31,546,106
1905	Apr. 14	Dec. 16	6,509,056	577,272	2,049,639	941,509	237,696	59,237	106,520	31,332,637	1,609,591	41	10,899	836,583	42,661,089	44,270,680
1906	Apr. 13	Dec. 17	8,739,630	649,535	2,528,141	1,304,236	391,105	65,543	107,633	35,357,042	1,467,142	.....	6,222	1,134,851	50,283,938	51,751,080
1907	....do...	Dec. 11	11,400,995	652,477	2,944,073	1,043,120	307,941	64,512	89,959	39,594,944	1,096,541	.....	898	1,022,654	57,120,673	58,217,214

[a] From 1895 figures include traffic through Canadian canal, opened to commerce September 9, 1895.
[b] Converted from barrels on basis 200 pounds equals 1 barrel.
[c] Converted from bushels on basis 60 pounds equals 1 bushel.
[d] Converted from bushels on basis 48 pounds equals 1 bushel.
[e] Converted from barrels on basis 280 pounds equals 1 barrel.
[f] Tonnage obtained by subtracting the total of all other commodities from total freight.

Table 31.—Receipts of flour and grain at New Orleans via rail and river, 1897–1898

(From Monthly Summary of Commerce and Finance, 1900.)

		1897.	1898.			1897.	1898.
Flour:				**Wheat:**			
Rail	barrels	[illegible]	[illegible]	Rail	bushels	[illegible]	[illegible]
River	do	[illegible]	[illegible]	River	do	[illegible]	[illegible]
Total	do	[illegible]	[illegible]	Total	do	[illegible]	[illegible]
Corn:				**Rye:**			
Rail	bushels	[illegible]	[illegible]	Rail	do		[illegible]
River	do	[illegible]	[illegible]	River	do	[illegible]	[illegible]
Total	do	[illegible]	[illegible]	Total	do	[illegible]	[illegible]
Oats:							
Rail	do	[illegible]	[illegible]				
River	do	[illegible]	[illegible]				
Total	do	[illegible]	[illegible]				

Table [illegible].—Grain shipments from St. Louis and grain movements at New Orleans, 1896–1908

(Compiled from reports of New York Produce Exchange.)

Year.	Shipments from St. Louis by river.	Total receipts at New Orleans.	Exports from New Orleans.	Year.	Shipments from St. Louis by river.	Total receipts at New Orleans.	Exports from New Orleans.
	Bushels.	*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	*Bushels.*
1868	[illegible]	[illegible]	[illegible]	1888	[illegible]	[illegible]	[illegible]
1869	[illegible]	[illegible]	[illegible]	1889	[illegible]	[illegible]	[illegible]
1870	[illegible]	[illegible]	[illegible]	1890	[illegible]	[illegible]	[illegible]
1871	[illegible]	[illegible]	[illegible]	1891	[illegible]	[illegible]	[illegible]
1872	[illegible]	[illegible]	[illegible]	1892	[illegible]	[illegible]	[illegible]
1873	[illegible]	[illegible]	[illegible]	1893	[illegible]	[illegible]	[illegible]
1874	[illegible]	[illegible]	[illegible]	1894	[illegible]	[illegible]	[illegible]
1875	[illegible]	[illegible]	[illegible]	1895	[illegible]	[illegible]	[illegible]
1876	[illegible]	[illegible]	[illegible]	1896	[illegible]	[illegible]	[illegible]
1877	[illegible]	[illegible]	[illegible]	1897	[illegible]	[illegible]	[illegible]
1878	[illegible]	[illegible]	[illegible]	1898	[illegible]	[illegible]	[illegible]
1879	[illegible]	[illegible]	[illegible]	1899	[illegible]	[illegible]	[illegible]
1880	[illegible]	[illegible]	[illegible]	1900	[illegible]	[illegible]	[illegible]
1881	[illegible]	[illegible]	[illegible]	1901	[illegible]	[illegible]	[illegible]
1882	[illegible]	[illegible]	[illegible]	1902	[illegible]	[illegible]	[illegible]
1883	[illegible]	[illegible]	[illegible]	1903	[illegible]	[illegible]	[illegible]
1884	[illegible]	[illegible]	[illegible]	1904		[illegible]	[illegible]
1885	[illegible]	[illegible]	[illegible]	1905		[illegible]	[illegible]
1886	[illegible]	[illegible]	[illegible]	1906		[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]				

The table following gives the percentage of each important commodity for the period 1881–1907. Iron ore, coal, lumber, and grain have always been the leading commodities carried.

TABLE 41—*Percentage of each commodity in the traffic through St. Marys Falls Canals, 1881–1907*

Year.	Coal.	Flour.	Wheat.	Grain, other than wheat.	Manufactured iron and pig iron.	Salt.	Copper.	Iron ore.	Lumber.	Silver ore and bullion.	Building stone.	Unclassified freight.	Flour, grain, and wheat.	Wheat and other grain.
1881..	18.8	3.9	6.6	0.6	5.6	0.6	1.9	47.7	6.0	.....	0.1	8.2	11.1	7.2
1882..	21.2	1.7	5.5	.6	4.6	1.2	1.2	48.6	6.6	.....	.3	8.5	7.8	6.1
1883..	31.5	3.0	7.8	.8	4.9	.4	1.4	34.9	6.7	.....	.1	8.5	11.6	8.6
1884..	24.6	4.3	12.5	.4	2.5	.7	1.3	39.5	6.4	0.4	.2	7.2	17.2	12.9
1885..	27.5	4.4	14.1	.3	1.9	.6	1.0	37.9	6.3	.1	.2	5.7	18.8	14.4
1886..	22.3	3.9	12.6	.4	2.5	.5	.9	46.1	5.5	.....	.2	5.1	16.9	13.0
1887..	24.6	2.9	12.6	.3	1.4	.5	.6	45.5	5.1	.....	.2	6.3	15.8	12.9
1888..	32.8	3.4	8.7	.8	1.0	.5	.5	40.1	6.3	.....	.5	5.4	12.9	9.5
1889..	21.7	3.0	6.5	.7	.8	.3	.4	54.5	7.5	.1	.4	4.1	10.2	7.2
1890..	24.1	3.6	5.4	.5	1.3	.3	.5	52.8	6.9	.....	.5	4.1	9.5	5.9
1891..	28.2	4.2	13.1	.3	.8	.4	.8	40.0	7.0	.....	.5	4.7	17.6	13.4
1892..	25.9	4.8	11.0	.4	.9	.3	.6	43.7	7.9	.....	.4	4.1	16.2	11.4
1893..	27.9	6.9	12.1	.5	.8	.3	.8	37.2	9.5	.....	.2	3.8	19.5	12.6
1894..	21.2	6.8	7.9	.3	.5	.2	.8	49.6	9.1	.....	.2	3.4	15.0	8.2
1895..	17.1	5.9	9.2	1.3	.7	.2	.7	53.5	8.1	.....	.2	3.1	16.4	10.5
1896..	18.6	5.5	11.7	4.1	.7	.2	.7	48.7	6.5	.....	.1	3.2	21.3	15.8
1897..	16.0	4.7	8.8	3.2	.7	.2	.7	50.0	6.6	.....	.....	3.1	16.7	12.0
1898..	17.8	3.7	8.8	2.9	1.2	.2	.6	55.1	6.8	.....	.....	2.9	15.4	11.7
1899..	15.6	2.8	6.9	2.9	.8	.2	.5	60.7	7.1	.....	.2	2.3	12.6	9.8
1900..	17.5	2.6	4.8	1.5	.5	.2	.5	64.1	6.0	.....	.2	2.1	8.9	6.3
1901..	16.2	2.7	5.6	2.1	.7	.2	.3	63.7	6.3	.....	.2	2.0	10.4	7.7
1902..	13.4	2.5	6.4	1.8	.6	.2	.3	67.5	5.1	.....	.1	2.1	10.7	8.2
1903..	20.0	2.0	5.3	2.2	.6	.2	.3	62.5	4.9	.....	.1	1.9	9.5	7.5
1904..	20.5	1.5	4.7	2.5	.7	.2	.4	62.3	4.9	.....	.....	2.3	8.7	7.2
1905..	14.7	1.3	4.6	2.1	.6	.1	.2	70.8	3.7	.....	.....	1.9	8.0	6.7
1906..	16.9	1.3	4.9	2.5	.8	.1	.2	68.3	2.8	.....	.....	2.2	8.7	7.4
1907..	19.6	1.1	5.1	1.8	.5	.1	.1	68.0	1.9	.....	.....	1.8	8.0	6.9

An analysis of traffic statistics for the St. Marys Falls canals is shown in table 42. One important fact shown is the relation of the cost of carrying per ton-mile from year to year. There has been a steady decline throughout the entire period with the exception of the years 1895, 1899, 1900, and 1905, when slight increases over the preceding years occurred. The lowest cost, 0.79 mill, existed in 1898; the highest, 1.5 mills, in 1888 and 1889. The decline since 1900 has been regular (except in 1905), and in 1907 was 0.38 mill less than in 1900. The table also shows steady increase in the value of American and Canadian craft, the increase being about the same in both cases.

The proportion of freight carried by Canadian vessels was the greatest in 1888, 1903, and 1904; the lowest appears in the year 1898. Since this date there has been an apparent increase, and, in the year 1907, 5 per cent of the freight carried is credited to their vessels.

Table [illegible]—Traffic statistics of [illegible] Alaska railroad, [illegible]

From Annual summary of Commerce and Finance December [illegible] [illegible]

Year ending.	Total freight handled.	Average haul per ton of freight.	Total tons moved.	Average haul per ton of freight moving one way.	Amount paid for transporting freight.	Cost of operation of freight.	Value of American craft.	Value of Canadian craft.	Proportion of freight carried in Canadian vessels.
	Tons.	*Miles.*		*Miles.*					*Per c.*
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The [illegible] shown in the table [illegible] the [illegible] of freight [illegible] the [illegible] of the [illegible] Alaska railroad for the period [illegible]—[illegible].

Table [illegible] Alaska railroad, [illegible]

From Annual summary of Commerce and Finance December [illegible] [illegible] December [illegible]

[illegible]	[illegible]	Tons	Value	Total value	Average value per ton	Tons per mile	Rate.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 43—*Estimated value of freight, by commodities, through St. Marys Falls Canals, 1887–1906*—Continued

Year.	Copper.	Iron ore.	Lumber.	Silver ore and bullion.	Building stone.	Unclassified freight.	Total.
1887	$6,977,200	$8,741,995	$2,974,068	$53,826	$134,010	$20,675,160	$79,031,757
1888	5,792,000	8,996,808	4,326,696	520,579	335,410	20,751,240	82,156,019
1889	6,691,200	14,335,492	5,679,972	914,589	335,380	18,744,000	83,732,527
1890	8,745,800	16,711,688	6,514,722	527,807	479,730	22,277,640	102,214,948
1891	13,838,000	12,460,744	6,593,490	266,211	440,800	25,025,580	128,178,208
1892	12,998,600	17,153,962	9,231,192	296,815	396,980	27,548,760	135,117,267
1893	17,506,000	14,050,946	10,593,810	379,861	194,260	24,910,800	145,436,957
1894	19,914,600	17,027,078	11,564,608	46,144	214,170	27,071,100	143,114,502
1895	21,490,400	22,332,319	8,888,400	11,200	238,760	27,798,480	159,575,129
1896	23,374,400	25,705,063	8,562,325	26,880	177,310	31,251,060	195,146,843
1897	24,464,800	31,901,145	10,875,762	560	62,490	34,742,880	218,235,927
1898	29,814,240	35,120,880	12,984,533	.....	46,700	37,388,760	233,069,741
1899	38,428,800	52,116,016	17,646,969	60,875	468,756	52,873,560	281,364,750
1900	39,319,800	61,663,380	15,009,241	13,750	586,824	54,139,700	267,041,959
1901	26,227,866	58,794,509	16,617,922	.....	559,008	69,755,125	280,906,865
1902	22,916,280	75,260,420	17,736,404	125	467,028	92,512,500	358,306,300
1903	25,961,710	74,709,398	18,057,456	.....	255,600	82,479,875	349,405,014
1904	26,305,200	52,034,862	16,388,220	74,580	325,116	98,821,215	334,502,686
1905	30,358,200	93,997,911	17,885,911	2,255	130,788	117,121,620	416,965,484
1906	36,595,220	121,981,795	19,813,882	.....	74,664	170,227,650	537,463,454

The movement of flour, wheat, and grain other than wheat is shown in the following table for the period 1855–1907. From 1855 to 1897 there was a steady increase in the tonnage of flour; since that period, however, a general decline is shown, especially in 1907, when only 6,524,770 barrels were carried. The wheat traffic has steadily increased during the entire period, with the exception of the years 1894, 1900, and 1904, when the more noticeable decreases occurred. Fluctuations are noticed in traffic of other grain, but the general tendency has been to increase, especially during the later years.

TABLE 44—*Flour and wheat traffic of the St. Marys Falls Canals, 1855–1907*

[From Monthly Summary of Commerce and Finance January, 1900, p. 1990, and December, 1907, p. 1176]

Year.	Flour.	Wheat.	Grain other than wheat.	Year.	Flour.	Wheat.	Grain other than wheat.
	Barrels.	*Bushels.*	*Bushels.*		*Barrels.*	*Bushels.*	*Bushels.*
1855	10,289	(a)	.....	1882	344,044	3,728,856	473,129
1856	17,686	(a)	33,908	1883	687,031	5,900,473	776,552
1857	16,560	(a)	22,300	1884	1,248,243	11,985,791	517,103
1858	13,782	(a)	10,500	1885	1,440,093	15,274,213	422,981
1859	39,459	(a)	71,738	1886	1,759,365	18,991,485	715,373
1860	50,250	(a)	133,437	1887	1,572,735	23,096,520	775,166
1861	22,743	(a)	76,830	1888	2,190,725	18,596,351	2,022,308
1862	17,291	(a)	59,062	1889	2,228,707	16,231,854	2,133,245
1863	31,975	(a)	78,480	1890	3,239,104	16,217,370	2,044,384
1864	33,937	(a)	143,560	1891	3,780,143	38,816,570	1,032,104
1865	34,985	(a)	.....	1892	5,418,135	40,994,780	1,666,690
1866	33,603	(a)	229,926	1893	7,420,674	43,481,652	2,405,344
1867	28,345	(a)	249,031	1894	8,965,773	34,869,483	1,545,008
1868	27,372	(a)	285,123	1895	8,902,302	46,218,250	8,328,694
1869	32,007	(a)	323,501	1896	8,882,858	63,256,463	27,448,071
1870	33,548	49,700	304,077	1897	8,921,143	55,924,302	24,889,688
1871	26,060	1,376,705	308,823	1898	7,778,043	62,339,996	26,078,384
1872	136,411	567,134	445,774	1899	7,114,147	58,397,335	30,000,935
1873	172,692	2,119,997	309,645	1900	6,760,688	40,489,302	16,174,659
1874	179,855	1,120,015	149,999	1901	7,634,350	52,812,636	24,760,547
1875	309,991	1,213,788	250,080	1902	8,910,240	76,730,965	27,740,822
1876	315,224	1,971,549	407,772	1903	7,093,380	61,384,552	32,095,646
1877	355,117	1,349,738	343,542	1904	4,710,538	49,928,809	33,030,992
1878	344,599	1,872,940	264,674	1905	5,772,719	68,321,298	39,229,553
1879	451,000	2,603,666	951,496	1906	6,495,350	84,271,358	54,343,155
1880	523,860	2,105,920	2,547,106	1907	6,524,770	98,135,775	43,463,338
1881	605,453	3,456,965	367,838				

[a] None shipped on Lake Superior prior to 1870.

MISCELLANEOUS CANAL TRAFFIC

[illegible]

The traffic passing through the Welland Canal this Canada is shown in the following table for the period 1902–1907. There has been an marked increase in the tonnage carried for the period shown. The tendency has been to remain [illegible]. The chief articles carried are coal, iron ore, [illegible], and lumber.

Table 41—Traffic through the Welland Canal Month, 1902–1907

From Monthly Summary of Commerce and Finance

Articles		1902	1903	1904	1905	1906	1907
Coal:							
Hard	Tons	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Soft	"	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Flour	Barrels	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grain, other than wheat, [illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iron ore	Tons	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Iron manufactures	"	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lumber	Feet	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Merchandise	Tons	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Miscellaneous	"	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]

TABLE 46—*Traffic through Sturgeon Bay and Lake Michigan ship canal, Wisconsin, 1904–1907*

[From Monthly Summary of Commerce and Finance]

Articles.		1904.	1905.	1906.	1907.
Agricultural implements	net tons		100		992
Alum	do			666	
Apples	barrels				800
Bark	cords		1,269	602	1,908
Barrels (empty)	number			6,450	1,500
Beets	net tons			1,100	350
Coal	do		86,029	109,653	124,822
Coke	do				690
Dairy products	do			1,146	706
Feathers	do				10
Fertilizer	do			150	1,164
Fish	do			2,306	2,177
Flour	barrels		12,800	55,330	18,361
Fruit	net tons			162	860
Glass	do				80
Hay	do			6,652	1,394
Hides	do		227	383	462
Iron manufactures	do		19,213	19,509	16,823
Iron ore	do		25,143	89,531	119,086
Leather	do			350	120
Logs	M. ft. B. M.			2,240	615
Lumber	do		151,293	132,140	138,489
Malt	net tons			1,107	
Marble	do				125
Oats	bushels		248,000	320,600	140,000
Oil	barrels			2,355	18,044
Paper	net tons		2,357	1,337	2,102
Pease	bushels		304,400	207,850	151,400
Pig iron	net tons		2,655	2,273	3,825
Piles	number			600	10,375
Poles	do		213,945	190,195	118,724
Posts	do		128,406	88,100	180,000
Potatoes	bushels			4,550	5,049
Rosin	net tons				25
Salt	barrels		34,829	158,295	288,546
Scrap iron	net tons				283
Stone	do		47,480	72,461	108,958
Sulphur	do				20
Ties	number		212,771	172,603	252,525
Tile	net tons			300	
Trees (Christmas)	number			15,000	
Trees (shade)	do				6,150
Twine	net tons				30
Wheat	bushels		410,400	203,600	570,000
Wood (fire)	cords		8,601	5,775	5,683
Wood (pulp)	do		945	1,947	2,852
General merchandise	net tons		75,598	63,391	58,377
Cement	do		3,350	8,046	21,233
Corn	bushels		231,499		
Total	net tons	577,976	639,246	704,105	775,496

TRAFFIC THROUGH DETROIT RIVER

The traffic passing through the Detroit River is shown in the following table for the years 1906 and 1907. Despite the fact that a falling off in grain traffic occurred there was an increase in the total over the preceding year of 7,000,000 tons. The coal traffic increased approximately 4,000,000 tons, while that of ore amounted to 3,000,000 tons.

Table 5.—Domestic freight movement through Detroit River

From monthly summary of Commerce and Finance.

Articles.		1909.	1907.	Articles.		1909.	1907.
Iron				Flour	Net tons	[illegible]	[illegible]
[illegible]	Gross tons	[illegible]	[illegible]	Wheat	Bushels	[illegible]	[illegible]
[illegible]	"	[illegible]	[illegible]	Corn	"	[illegible]	[illegible]
Bituminous	"	[illegible]	[illegible]	Oats	"	[illegible]	[illegible]
Coal:				Barley	"	[illegible]	[illegible]
Hard	Net tons	[illegible]	[illegible]	Rye	"	[illegible]	[illegible]
Soft	"	[illegible]	[illegible]	Flaxseed	"	[illegible]	[illegible]
Salt	"	[illegible]	[illegible]	Transshipment freight, net tons		[illegible]	[illegible]
Lumber	Net board feet	[illegible]	[illegible]				
[illegible]	"	[illegible]	[illegible]	Total	Net tons	[illegible]	[illegible]
Cement	Net tons	[illegible]	[illegible]				
[illegible]	"	[illegible]	[illegible]				

MISCELLANEOUS LAKE TRAFFIC

The distribution of coal traffic by lake from the city of Buffalo during the period 1901–1910 is shown in the following table. Approximately one-half of Chicago, Milwaukee, Superior and Duluth follow next in importance. These four cities receive about 80 per cent of the coal traffic.

Table 6.—Distribution of coal traffic by lake from Buffalo, 1901–1910

From annual report of Chamber of Commerce, Buffalo, 1910.

Port.	1901.	1902.	1903.	1904.	1905.	1906.
Chicago	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Milwaukee	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Duluth	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Superior	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]

The following statement, compiled from the Cleveland Iron Trade Review, shows the lake receipts of iron ore at Lake Erie ports during the seasons of 1901 to 1906, inclusive.

TABLE 49—*Lake receipts of iron ore at Lake Erie ports, 1901–1906*

Port of—	1901.	1902.	1903.	1904.	1905.	1906.
	Gross tons.	*Gross tons.*	*Gross tons.*	*Gross tons.*	*Gross tons.*	*Gross tons.*
Toledo	798,298	1,038,571	652,305	508,793	1,006,855	1,423,741
Sandusky	33,017	165,556	130,532	48,356	51,202	35,847
Huron	431,311	520,648	486,106	231,364	825,278	778,453
Loraine	721,662	1,442,417	990,490	927,931	1,605,823	2,191,965
Cleveland	3,381,060	4,873,318	4,434,160	3,572,228	5,854,745	6,604,661
Fairport	1,181,776	1,538,744	1,434,342	1,157,858	2,008,621	1,861,498
Ashtabula	3,981,170	4,796,805	4,242,160	3,639,250	6,963,005	6,833,352
Erie	1,379,377	1,717,268	1,257,798	1,284,778	2,112,476	1,986,539
Conneaut	3,181,019	4,300,301	3,903,937	4,083,655	5,327,552	5,432,370
Buffalo and Tonawanda	1,475,386	2,256,798	2,149,901	2,433,601	3,312,725	4,928,331
Total	17,014,076	22,649,424	19,681,731	17,932,814	29,068,282	32,076,757

4. GOVERNMENT AID TO INLAND NAVIGATION

The United States Government has assisted in the improvement and construction of navigable waterways in several ways. Grants both of lands and money have been made to the States; for a time subscriptions were made to the stock of private canal companies; and for many years large appropriations have been made directly for the improvement of rivers and harbors.

GRANTS TO THE STATES

The first appropriation by Congress for internal improvement was made in the enabling act for the State of Ohio, April 30, 1802. It provided that one-twentieth part of the proceeds from the sale by Congress of public lands lying in said State should be applied to the laying out and making public roads from the navigable waters emptying into the Atlantic to the Ohio River, to the said State, and through the same, such roads to be laid out under the authority of Congress, with the consent of the several States through which the roads should pass. In the act of March 3, 1803, 3 per cent of the net proceeds of land sales was given to Ohio for roads within the State, and for no other purpose whatever.

Similar provisions for a grant of 5 per cent of the net proceeds of the sales of public lands within each State have been made in the subsequent acts for the admission of the various public-land States to the Union. In the different acts there is some variation in the purposes for which the grants were made. The early acts usually made the appropriation for roads and canals; later acts (after 1836) made the proceeds available for roads and internal improvements; and the act for Nevada (1864) applied it to roads and irrigation ditches. Beginning with the four States admitted in 1889, the proceeds of this 5 per cent grant have been granted as a permanent fund for the support of common schools.

Up to 1887 the amounts accruing to the various States for the proceeds of the cash sales of public lands aggregated $7,123,549.83. The States have insisted that they were entitled to 5 per cent not only on the cash sales, but also on the value of public lands within their limits set aside for permanent Indian reservations and disposed of in satisfaction of bounty-land warrants and agricultural college or other scrip issued by the United States in payment of its obligations. A bill now before Congress proposes to recognize this claim, which it is estimated will amount to about $8,182,000.[6]

[6] Congressional Record, vol. 42, p. 538.

CANAL GRANTS

In 1824 a special canal act for Indiana was passed, but this was not utilized. The first effective act making grants of land to States for the specific purpose of securing construction of canals was passed March 2, 1827. This act gives such grants of land to the States of Indiana and Illinois. Two and a half sections of land on each side of the canal were granted, the United States reserving alternate sections, thus beginning a policy which has become the rule in land grants for improvements. Part of the grant made to Indiana by this act of 1827 was afterwards transferred to Ohio.

Additional grants of land for canals were subsequently made to all of the above-named States and also to Wisconsin and Michigan, as is shown in the following table. The total area of all grants made to the States for canals from 1827 to 1866 has been 4,424,073.06 acres.

TABLE 50—*Land grants for canals*

[Forty-sixth Congress, third session, H. Ex. Doc. 47; pt. 4. "The Public Domain," 1881, p. 258]

State.	Date of law.	Statutes.	Name of canal.	Total acres granted and certified.
Indiana	Mar. 26, 1824	Vol. 4, p. 47	Wabash and Erie Canal	.....
	Mar. 2, 1827	Vol. 4, p. 236		234,246.73
	May 29, 1830	Vol. 4, p. 416		29,552.50
	Feb. 27, 1841	Vol. 5, p. 414		259,368.48
	Aug. 29, 1842	Vol. 5, p. 542		24,219.83
	Mar. 3, 1845	Vol. 5, p. 731		796,630.19
	May 9, 1848	Vol. 9, p. 219		113,348.33
Ohio	Mar. 2, 1827	Vol. 4, p. 236	Wabash and Erie Canal	266,535.00
	June 30, 1834	Vol. 4, p. 716		
	May 24, 1828	Vol. 4, p. 305	Miami and Dayton	323,826.00
	Apr. 3, 1830	Vol. 4, p. 393		
	May 24, 1828	Vol. 4, p. 306	General canal purposes	500,000.00
Illinois	Mar. 2, 1827	Vol. 4, p. 234	Canal, Illinois River to Lake Michigan	290,915.00
	Aug. 3, 1854	Vol. 10, p. 344		
Wisconsin	June 18, 1838	Vol. 5, p. 245	Milwaukee and Rock River Canal	125,431.00
	Apr. 10, 1866	Vol. 14, p. 30	Breakwater and Harbor Ship Canal	200,000.00
	Mar. 1, 1872	Vol. 17, p. 32	Breakwater extending time to Apr. 10, 1874	.....
	Mar. 7, 1874	Vol. 18, p. 20	Breakwater extending time to Apr. 10, 1876	.....
Michigan	Aug. 26, 1852	Vol. 10, p. 35	St. Marys Ship Canal	750,000.00
	Mar. 3, 1865	Vol. 13, p. 519	Portage Lake and Lake Superior Ship Canal	200,000.00
	July 3, 1866	Vol. 14, p. 81		200,000.00
	July 6, 1866	Vol. 14, p. 80	Lac La Belle Ship Canal	100,000.00

RECAPITULATION

Indiana	1,457,366.06
Ohio	1,100,361.00
Illinois	290,915.00
Wisconsin	325,431.00
Michigan	1,250,000.00
Total	4,424,073.06

STATE SELECTION ACT

By an act of September 4, 1841, Congress granted to the States named in the act and "to each new State that shall hereafter be admitted into the Union" 500,000 acres of public lands for internal improvements, including the land granted to such States for such purposes before their admission.

Selections under this act amounted in 1890 to 7,500,554.67 acres, as shown in the following table:

TABLE 10.—State summary.[1]

Fifty-second Congress, first session, H. Ex. Doc. 47, pt. 6, 1891. The Public Domain, p. 22.

State.	Acres.	Disposition.
Illinois	[illegible]	Satisfied.
Missouri	[illegible]	Do.
Indiana	[illegible]	Do.
Mississippi	[illegible]	Do.
Louisiana	[illegible]	Do.
Michigan	[illegible]	Do.
Alabama	[illegible]	Do.
Florida	[illegible]	[illegible] selected.
Iowa	[illegible]	Satisfied.
Wisconsin	[illegible]	Do.
California	[illegible]	[illegible] selected.
Kansas	[illegible]	Satisfied.
Minnesota	[illegible]	Do.
Oregon	[illegible]	Do.
Nevada	[illegible]	[illegible] selected.
Nebraska	[illegible]	Satisfied.
Colorado	[illegible]	[illegible] selected.
Total	[illegible]	
Not selected	[illegible]	
Selected to June 30, 1890	[illegible]	

[1] Ohio and Indiana had already received their quota for internal improvements and Illinois and Alabama had received part of the 500,000 acres under grants previous to the State Selection Act. See above table of Land Grants for Canals.

NAVIGATION GRANTS

By an act of August 8, 1846, a grant of land was made to the Territory of Iowa for the purpose of improving the navigation of the Des Moines River from its mouth to the Raccoon Fork. This act was a peculiar one and was the subject of much departmental and judicial construction, and finally was partially merged into the grant in aid of the Keokuk, Fort Des Moines and Minnesota Railroad. Another act passed the same day as the Iowa grant, August 8, 1846, gave to Wisconsin, when admitted as a State, land for the improvement of the Fox and Wisconsin rivers, and to build a canal to connect them.

LATER STATE GRANTS

In the enabling acts for North Dakota, South Dakota, Montana, and Washington, February 22, 1889; Idaho, July 3, 1890; Wyoming, July 10, 1890; and Utah, July 16, 1894, in lieu of the grant of land for internal improvements, 500,000 acres were given for specific educational or charitable institutions and public buildings, except in the case of Utah, where 500,000 acres were given for these purposes and 500,000 acres in addition for irrigation works.[1]

[1] See Railroad Co. v. Lindsley, 23 Howard, 10.

[1] These grants of public lands issued by the General Land Office March 1, 1890, pp. 8 and 9.

SUBSCRIPTIONS

In addition to the land grants to States, Congress subscribed to the stock of various canal companies, as shown in the following table:

TABLE 52—*Acts of Congress authorizing the Government to subscribe for or purchase stock of private canal companies or loan money to the same*

Date of act.	Canal company.	Number of shares.	Amount.	Remarks.
Mar. 3, 1825	Chesapeake and Delaware	2,250	$225,000	Purchase or subscription.
Mar. 2, 1829	do	2,250	225,000	Do.
May 13, 1826	Louisville and Portland	1,000	100,000	
Mar. 2, 1829	do	1,350	135,000	
May 18, 1826	Dismal Swamp	600	150,000	
Mar. 2, 1829	do	200	50,000	
July 25, 1866	do			Sale of shares.
Jan. 11, 1868			1,000,000	Sale postponed to Feb. 8, 1868.
May 24, 1828	Chesapeake and Ohio	10,000		
Mar. 3, 1837			300,000	Loan to Alexandria Canal.
June 25, 1832			100,000	Loan to Alexandria Canal for aqueduct.

APPROPRIATIONS

The following tables show the appropriations made by Congress for river improvements (excluding harbors) and canals, from 1802 to 1900, with a statement of subsequent appropriations for river and harbor improvements from 1900 to 1907:

TABLE 53—*Acts of Congress making appropriations for rivers and canals, 1802–1900*

[Analytical and topical index, reports, Chief of Engineers, 1866–1900.]

Date of act.	Rivers.	Canals.	Date of act.	Rivers.	Canals.
April 6, 1802	$30,000.00		March 1, 1843	$150,000.00	
April 18, 1806	448.71		Do	3,471.57	
February 10, 1809		$25,000.00	June 11, 1844	305,000.00	
March 3, 1821	150.00		June 15, 1844	7,500.00	
May 24, 1824	75,000.00		Do	14,000.00	
March 3, 1825		300,000.00	February 26, 1845		$5,000.00
May 13, 1826		100,000.00	March 3, 1845	240.00	
May 18, 1826		150,000.00	Do	7,000.00	
May 20, 1826	25,000.00		March 2, 1847	7,751.92	
March 2, 1827	12,000.00		March 3, 1847	6,479.25	
Do	5,383.40		March 3, 1849	651.76	
March 3, 1827	30,000.00		August 30, 1852	1,074,590.00	
May 19, 1828	3,500.00		July 22, 1854	140,000.00	
May 23, 1828	150,513.00		July 8, 1856	330,000.00	
May 24, 1828		1,000,000.00	Do	100,000.00	
March 2, 1829	30,000.00		Do	45,000.00	
Do		200,000.00	August 16, 1856	200,000.00	
Do		133,500.00	June 9, 1860	1,350.00	
March 3, 1829	50,000.00		June 12, 1860	1,406.94	
April 23, 1830	95,694.72		July 1, 1864		225,276.83
March 2, 1831	46,880.00		June 23, 1866	1,558,900.00	280,000.00
Do	200,000.00		March 2, 1867	1,374,688.00	650,000.00
July 3, 1832	154,970.32		Do	36,000.00	
March 2, 1833	15,000.00		July 25, 1868	712,000.00	471,000.00
Do	95,900.00		April 10, 1869	708,188.00	498,960.00
June 28, 1834	155,527.00		December 23, 1869		200,000.00
June 30, 1834		28,337.55	July 11, 1870	1,768,500.00	816,500.00
Do	70,000.00		July 15, 1870	5,000.00	
Do	6,240.63		January 18, 1871		541,000.00
February 24, 1835	17,000.00		February 2, 1871		100,000.00
March 3, 1835	231,000.00		March 3, 1871	1,595,000.00	751,500.00
July 2, 1836	395,600.05		June 10, 1872	13,713.97	
July 4, 1836	160,000.00	15,000.00	Do	2,430,300.00	1,004,000.00
March 3, 1837	754,963.00	300,000.00	March 3, 1873	2,885,000.00	800,000.00
April 20, 1838	70,000.00		Do	34,988.53	
July 7, 1838	408,573.00	10,000.00	Do	40,000.00	
March 3, 1839	15,000.00		April 3, 1874	30,000.00	
July 20, 1840	1,075.39		May 11, 1874		1,675,354.31
March 3, 1841	75,000.00		June 23, 1874	2,452,500.00	600,000.00
August 23, 1842	100,000.00		Do	10,000.00	

TABLE 54.—*Acts of Congress making appropriations for rivers and canals, 1878–1910*—Continued

Date of act.	Rivers.	Canals.	Date of act.	Rivers.	Canals.
March 3, 1877	$2,679,000.00	$750,000.00	March 3, 1899	$[illegible]	
July 31, 1878	31,000.00		February 22, 1900	[illegible]	
August 14, 1878	1,400,000.00	650,000.00	August 30, 1900	1,735	
February 7, 1879	40,000.00		September 19, 1900	14,[illegible]	[illegible]
April 10, 1879		7,500.00	September 19, 1900	[illegible]	
June 14, 1879	1,400,000.00	425,000.00	January 29, 1901	1,[illegible]	
Do	150,000.00		March 3, 1901	[illegible]	
June 30, 1879	1,[illegible]		Do	[illegible]	400,000.00
January 31, 1881	101,[illegible]		Do	[illegible]	
March 3, 1879	4,200,000.00	300,000.00	July 31, 1902	[illegible]	1,[illegible]
June 29, 1879	[illegible]		July 29, 1902	[illegible]	
June 14, 1880	1,[illegible]	400,000.00	August 1, 1902	[illegible]	
June 16, 1880	1,[illegible]		March 3, 1903	[illegible]	1,[illegible]
Do	150,000.00		Do	15,000.00	
March 3, 1881	150,000.00		August 24, 1904	4,[illegible]	425,000.00
Do	[illegible]	117,000.00	Do	1,[illegible]	300,000.00
March 31, 1882	100,000.00		August 22, 1904	4,[illegible]	
May 4, 1882	30,000.00		Do	[illegible]	
August 1, 1882	21,[illegible]	225,000.00	March 3, 1907	[illegible]	
August 7, 1882	150,000.00		Do	4,[illegible]	[illegible]
Do	1,[illegible]		February 26, 1908	[illegible]	
March 3, 1883	1,000,000.00		May 2, 1908	[illegible]	
Do	150,000.00		June 1, 1908	[illegible]	[illegible]
January 19, 1884	1,000,000.00		June 2, 1908	300,000.00	[illegible]
March 3, 1884	4,100,000.00		Do		4,[illegible]
July 1, 1884	1,[illegible]	150,000.00	February 26, 1907	[illegible]	
July 7, 1884	41,[illegible]		March 2, 1907	[illegible]	
May 28, 1886	4,[illegible]		June 6, 1907	1,[illegible]	1,[illegible]
August 4, 1886	[illegible]		July 19, 1907	1,[illegible]	
August 5, 1886	4,[illegible]	[illegible]	July 1, 1908	[illegible]	[illegible]
February 1, 1888	[illegible]		January 5, 1909	[illegible]	
March 19, 1888	4,000,000.00		March 3, 1909	[illegible]	[illegible]
April 2, 1889	[illegible]		June 4, 1909	[illegible]	[illegible]
August 11, 1888	21,[illegible]	[illegible]	September 19, 1909	[illegible]	
Do	[illegible]		Total	[illegible]	[illegible]
September 1, 1888	15,000.00				
September 19, 1888	40,[illegible]				

TABLE 55.—*Appropriations for rivers and harbors on permanent basis, 1906–1907*

	1900.	1901.	1902.	1903.
Regular appropriations	$[illegible]	$[illegible]	$[illegible]	$[illegible]
Permanent annual appropriations	[illegible]	[illegible]	[illegible]	[illegible]
Indefinite appropriations (opening and cleaning of canals and improving sunken vessels)	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

	1904.	1905.	1906.	1907.
Regular appropriations	$[illegible]	$[illegible]	$[illegible]	$[illegible]
Permanent annual appropriations	[illegible]	[illegible]	[illegible]	[illegible]
Indefinite appropriations	[illegible]	[illegible]	[illegible]	[illegible]
Total	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

1900	$[illegible]
1901	[illegible]
1902	[illegible]
1903	[illegible]
1904	[illegible]
1905	[illegible]
1906	[illegible]
1907	[illegible]
Total	[illegible]

5. GOVERNMENT SLACK-WATER RIVERS

Facts relating to the Government slack-water rivers are set forth in the accompanying table, which shows the location of each stream, the navigable length of the river and the slack-water portion, the number and dimensions of locks, traffic statistics, and the total Government expenditures so far as ascertained, with such "remarks" as are needed to call attention to special facts concerning each river. The rivers included in this table are only those where navigation has been improved by means of locks and dams. It does not include many rivers where the Government has carried on improvements of other kinds; nor does it include rivers for which slack-watering projects have been urged or authorized, but on which no important work has yet been completed.

Where two dates appear in the column headed "Year" under "Traffic" the statistics are for the fiscal year ending June 30.

TABLE 53.—Government slack-water rivers

River	When built.	Illuminations: Length. Total miles.	Illuminations: Length. Slack-water, miles.	Illuminations: Depth.	Locks. Number.	Locks. Length.	Locks. Width.	Total expenditure expended (also to June 30, 1907).	Traffic. Year.	Traffic. Freight.	Remarks.
				Feet.		Feet.	Feet.			Tons.	
TRIBUTARY TO ATLANTIC OCEAN.											
Congaree:											
Navigable section, mouth to Columbia, S. C.		51.0		4					1891	9,401	
									1895	8,001	
Slack-water section, Granby, S. C., to Columbia.	1900-1904		5.00		1	150	55.0	3,555,000	1903	121,361	
									1908	35,202	
TRIBUTARIES TO THE GULF OF MEXICO (exclusive of Mississippi).											
Plaquemine Bayou, Grand River, and Pigeon Bayou:											
Navigable section, Mississippi River to Grand Lake.		30.0		10					1900	88,543	
Slack-water section, Lock at junct. on with Mississippi River.	1908				a 1	b 305 b 150	55.0	1,525,051	1903 1906	302,300 372,000	
Black Warrior and Warrior:											
Navigable section, Demopolis, Ala., to Daniels Creek, Ala.		154.5									
Slack-water section, from 30 miles below Tuscaloosa to 15 miles above Tuscaloosa.	1888		91.00	6	7	380	55.0	2,540,307	1906-7	97,948	Improvements contemplated to a point 80 miles above Tuscaloosa, and in this stretch of the river the construction of 4 additional locks and dams is authorized, and 3 others projected. Below Tuscaloosa 3 other locks and dams are under construction.
Coosa:											
Navigable section:											
Mouth to Wetumpka, Ala.		11.0									Locks Nos. 1-3 in operation, Nos. 4 and 31 under construction, 30 other locks projected between Lock No. 4 and Wetumpka, Ala.
Dam No. 4 (about 25 miles below Greenport, Ala.) to Rome, Ga.		187.0		9 c					1906-7	134,078	
Slack-water section, Lock No. 4 to Greenport.	1878		95.00	3	3	100	40.0	c 1,040,430			

a Not completed.
b Two sets of gates.
c About 10 per cent of this amount expended for maintenance, the expenditures on the section between Wetumpka and the mouth of the river to June 30, 1907, was $400,423 additional, of which about 24 per cent was for maintenance.

TABLE 55—*Government slack-water rivers*—Continued

River.	When built.	Dimensions. Length. Total miles.	Dimensions. Length. Slack water, miles.	Dimensions. Depth.	Locks. Number.	Locks. Length.	Locks. Width.	Total Government expenditures to June 30, 1907.	Traffic. Year.	Traffic. Freight.	Remarks.
MISSISSIPPI RIVER AND TRIBUTARIES.											
				Feet.		*Feet.*	*Feet.*			*Tons.*	
Allegheny:											
Navigable section—mouth to Olean, N. Y.		255.0							1906	2,583,757	
Slack-water section—mouth to Natrona, Pa.	1893–		25.00		[a] 3	286 289	55.0 56.0	[b] $1,347,869			
Monongahela:											
Navigable section—mouth to 4 miles above Fairmont, W. Va., up West Fork River.		131.0									In 1836 the Monongahela Navigation Co. was incorporated and authorized by the Pennsylvania legislature to improve the river from Pittsburg to the Virginia State line, 91.5 miles. This company built 7 locks and dams, producing slack water from Pittsburg to within 2 miles of the present West Virginia State line. The property was acquired by the United States in 1897. Locks and Dams 8 and 9 originally projected in 1872; completed in 1899. The existing project for the construction of Locks 10 to 15 was approved in 1892; completed in 1904. Report of Chief of Engineers, 1887, p. 1802; also Report, 1896, p. 2142; 1906, pp. 513-515.
Slack-water section—											
Mouth to Dam No. 4	1841-1907		41.18	7½-8	[c] 4 [d] 4	[e] 158 [e] 216 to 360	[c] 50.0 [d] 56.0	6,845,857	1901-2 1903-4	9,100,887 9,268,736	
Dam No. 4 to Morgantown, W. Va.			60.77	7	5	159 to 165	50.0		1905-6	11,447,444	
Morgantown to 4 miles above Fairmont, W. Va.			29.05	7	6	182	56.0		1906-7	11,817,128	
Ohio:											
Navigable section—Cairo, Ill., to Pittsburg, Pa.		967.0									
Slack-water section—											
Pool formed by dam at Davis Island, Pa.	1878-1885		[e] 14.16	10	1	600	110.0	5,791,334	1900 1903	14,054,322 12,499,842	The existing project contemplates a system of 37 locks and dams to a point about 12 miles below Cincinnati; work on this project is being carried on.
Pools formed by dams Nos. 2 and 6, Pa.	1898-1906			9	2	600	110.0		1905 1906	13,163,656 11,427,784	
Muskingum:											
Navigable section—mouth to Dresden, Ohio.		91.0		3-6					1904	60,146	United States acquired possession of the works in this river in 1886-87. It is believed that this improvement has had no material effect on freight rates. The cooperation of the State of Ohio was required by Congress to make the appropriation, $110,000, available for improvement of the river above Zanesville.
Slack-water section—mouth to 9 miles above Zanesville, Ohio.	1836-1891		84.00	[f] 6	10	156 to 366	36.0 to 56.0	[g] 1,837,625	1906	50,300	

Little Kanawha:													
Navigable section—Burnsville, W. Va.	mouth to		[illegible]		[illegible]						[illegible]	[illegible]	
Black-water section—Creston, W. Va.	mouth to	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Great Kanawha:													
Navigable section—Loup Creek Shoal.	mouth to		[illegible]		[illegible]						[illegible]	[illegible]	
Black-water section—Loup Creek Shoal.	mouth to	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Big Sandy:													
Navigable section—Williamson, W. Va., up Tug Fork, and to Pikeville, Ky., up Levisa Fork.	mouth to		[illegible]								[illegible]	[illegible]	[illegible]
Black-water section—Louisa, Ky.	mouth to	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Kentucky:													
Navigable section—Irvine, Ky.	mouth to		[illegible]			[illegible]					[illegible]	[illegible]	
Black-water section—Irvine, Ky.	mouth to	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]			
Green and Barren:													
Navigable section													
Mouth to Bowling Green, Ky., on Barren River													
Mouth of Barren to Mammoth Cave, Ky., on Green River			[illegible]								[illegible]	[illegible]	
Black-water section:													
Lock 1 to Bowling Green, Ky.		[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	.....	.....	
Green River above Barren.	mouth of			[illegible]	[illegible]			[illegible]	[illegible]				

[a] Dams 2 and 3 not yet completed, though the locks are in operation.
[b] Of this amount $[illegible] was for maintenance.
[c] Old.
[d] New.
[e] The pools formed by Dams 1, 2, and 3 are 4.72, 4.44, and 5 miles long, respectively.
[f] Three feet over lower sill of lock No. 1.
[g] Includes $1,713,240 for operating and care.
[h] Of this amount $75,000 was paid for acquisition of Locks 1–4, $[illegible] for repair to same, and $[illegible] for maintenance of the system.
[i] Of this amount the sum of $777,969 has been expended for operation and care.
[j] Flatboat navigation extends above Louisa for 55 miles to Williamson, W. Va., and for [illegible] miles to Pikeville, Ky.
[k] Includes expenditures for maintenance.
[l] Nine locks were built between 1942 and 1953; two more locks completed since.
[m] At extreme low water only 2½ feet can be carried over the lower sill of Lock No. 1.
[n] Of this amount the sum of $1,593,232 was expended for operation and care.
[o] Depth over lower miter sill of Lock No. 1, Green River, at extreme low water, is 1 foot.
[p] Two locks (Nos. 6 and 7) have been completed since 1959.

TABLE 55—*Government slack-water rivers*—Continued

River.	When built.	Dimensions. Length. Total miles.	Dimensions. Length. Slack water, miles.	Dimensions. Depth.	Locks. Number.	Locks. Length.	Locks. Width.	Total Government expenditures to June 30, 1907.	Traffic. Year.	Traffic. Freight.	Remarks.
MISSISSIPPI RIVER AND TRIBUTARIES—continued.											
Rough:				*Feet.*		*Feet.*	*Feet.*			*Tons.*	
Navigable section—mouth to just above Hartford, Ky.	.....	29.5	.....		.....	.....	.....	.....	1903-4	33,076	
Slack-water section—mouth to just above Hartford, Ky.	1894-1896	.....	29.50	4	1	123	27.0	[a] 114,124	1906-7	30,984	
Wabash:											
Navigable section—mouth to Vincennes, Ind.	.....	126.0	.....	.....	.....	.....	.....	.....	1901-2 1904-5 1906-7	2,448 8,025 6,600	
Slack-water section—Grand Rapids to 12 miles above.	1872-1894	.....	12.00	1½ to 2	1	214	52.0	[b] 746,267			
Cumberland:											
Navigable section—mouth to Burnside, Ky.	.....	518.0	.....	.....	.....	.....	.....	.....	1906	[c] 223,890	
Slack-water section—pools above Lock A, 41.4 miles below Nashville, Tenn., to 26 miles above Nashville.	1889-	.....	67.40	6	[d] 3	280	52.0	[e] 3,052,111	.....	[f] 334,351	
Mississippi:											
Navigable section—mouth to Cass Lake, Minn.	.....	2,429.5	.....	(*g*)	.....	.....	.....	.....	.....	.....	
Slack-water section—pool formed by dam near Meekers Island to Minneapolis.	1899-1902	.....	3.75	4	1	303	80.0	[h] 932,573	1906	(*i*)	
Galena:											
Navigable section—Mouth to Galena, Ill.	.....	4.0	.....	.....	.....	.....	.....	.....	.....	.....	
Slack-water section—pool formed by dam 2 miles from Mississippi River.	1890-1894	.....	2.00	2	1	307	52.0	[j] 172,907	1906-7	4,128	
Illinois:											
Navigable section—mouth to La Salle, Ill.	.....	[k] 225.0	.....	7—	.....	.....	.....	.....	1906	22,385	
Slack-water section—Kempsville to La Salle, Ill.	1881-1893	.....	[k] 194.0	7—	[l] 4	325	73.0	[m] 1,515,721			

White												
Navigable section mouth to Fayetteville, Ark.		[illegible]		[illegible]						[illegible]	[illegible]	[illegible]
Black water section, Fayetteville 1 mile below Batesville to above mouth above Batesville	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PRINCIPAL TRIBUTARIES OF THE WHITE RIVER												
Fox												
Navigable section, Fayetteville, Ark., to Fox, Ark.		[illegible]										
Black water section, Fayetteville to Del Rio, Ark.	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible] to [illegible]	[illegible]	[illegible]	[illegible]	[illegible]
PRINCIPAL TRIBUTARIES OF THE CUMBERLAND RIVER												
Caney												
Navigable section mouth to McMinnville, Tenn.		[illegible]										
Black water section, just from dam 2 miles above the mouth to McMinnville	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[a] Includes $[illegible] expended for operation and care of lock
[b] Includes $21,[illegible] for operation and maintenance of lock
[c] Below Nashville. Navigation below Nashville is practically closed for several months each year during low water. In this connection, see remarks on table of Navigable Streams.
[d] Several other locks under construction above Nashville
[e] Of this amount $[illegible] was for maintenance
[f] Above Nashville
[g] See table of Navigable Streams
[h] Including a small amount for maintenance
[i] [illegible] about [illegible] tons.
[j] This is the total amount appropriated, including $[illegible] paid by the Government as purchase price of the improvement
[k] Of this distance [illegible] have been controlled by the Government and [illegible] miles by the State of Illinois
[l] Part of these locks were built by the State of Illinois
[m] Part of this amount was expended for maintenance
[n] Includes $[illegible] for care and operation
[o] Includes $1,414,314 for care and operation
[p] Full amount not separable from amounts expended for improvement of Willamette River. The expenditures up to June 30, 1915, for operation and care of lock and dam in the Yamhill River amounted to $24,400

6. CANALS IN THE UNITED STATES

LOCATION OF CANALS

Canals in the United States include: (*a*) Government canals, (*b*) State canals, (*c*) private canals.

Geographically they are distributed as shown on the accompanying map prepared in the office of the Bureau of Corporations.

LOCATION OF GOVERNMENT CANALS

Grouped with reference to their situation, Government canals are as follows:

Lake Group

1. Canals on the through route between Buffalo and Duluth, including the St. Clair Flats Canal and the St. Marys Falls Canal.
2. Branch canals of the lake group, represented by the Sturgeon Bay and Lake Michigan Canal; the Portage Lake and Lake Superior canals, and the Portage Canal connecting the Fox and Wisconsin rivers.
3. Lake harbor canals, or those of a rather local nature, including the Duluth Ship Canal and the Benton Harbor Canal.

Mississippi Valley

4. The Illinois and Mississippi Canal (Hennepin), which has just been completed, uniting the waters of Lake Michigan with those of the Mississippi River.
5. The Des Moines Rapids Canal near Keokuk on the through Mississippi river route between St. Paul and St. Louis.
6. The Louisville and Portland Canal on the through route between Pittsburg and Cairo.
7. Tennessee River canals, establishing through communication between Chattanooga, Tenn., and Paducah, Ky., including the Big Muscle Shoals Canal, Elk River Shoals Canal, and Colbert and Bee Tree Shoals Canal.

Atlantic and Gulf Coast

8. The Estherville-Minim Creek Canal, a successor in a way to the old Santee River Canal in South Carolina. The purpose of the Estherville-Minim Creek Canal is to furnish an outlet for the Santee River into Winyah Bay.
9. Gulf canals, embracing Port Arthur Canal, at Port Arthur, Texas; the Morgan Ship Canal, a link in the waterway connecting Houston with Galveston Bay; and the Galveston and Brazos Canal, extending from Galveston Bay to the Brazos River.

Pacific Coast

10. Canals of the Pacific coast include the Cascades Canal, an improvement of the Columbia River, Oregon, where it passes

through the Cascade Mountain range; and the Lake Washington Canal, Washington, a waterway in course of construction, which is to connect the waters of Lake Union and Lake Washington with those of Puget Sound.

LOCATION OF STATE CANALS

State canals in operation exist only in New York, Ohio, Illinois, and Louisiana. Their relative importance is in the order named.

New York Canals

The several canals of this State, which are of more than local importance, are as follows:

1. *Erie Canal.*—The main line of this canal extends from Albany to Buffalo, 352 miles, and forms part of the through route between New York City, via the Hudson River, and Chicago, Duluth, and other lake ports.

2. *Champlain Canal.*—This canal unites the Erie Canal, Lake Champlain, and the St. Lawrence River, with which Lake Champlain connects by means of the Richelieu River and the Canadian Chambly Canal. The Champlain Canal extends from Whitehall to West Troy, 66 miles.

3. *Black River Canal.*—This canal with its feeder and reservoir, and the Black River Improvement, a State enterprise, collectively embrace more than 90 miles of waterways. This waterway does not open through communication between Lake Erie and the Hudson River on the one hand and Lake Ontario on the other, the Black River not being navigable between Carthage and Lake Ontario.

4. *Oswego Canal*, running from Oswego on Lake Ontario to Syracuse on the Erie Canal, a distance of 38 miles. This canal is fed by the Oswego River, which forms part of the waterway, the bed of the river being canalized for about half the total distance. Ramifications of this canal include the Baldwinsville Side Cut, the Onondaga River Improvement, and the Seneca River Towing Path.

5. *Cayuga and Seneca Canal.*—This canal is 23 miles long and extends from Montezuma on the Erie Canal to Geneva on Lake Geneva. The Cayuga branch of the canal is 2 miles long. Formerly this canal was of much importance, because of its relation to the continuous line of inland waterways between the Erie Canal and Chesapeake Bay via the Chemung Canal and the canals of Pennsylvania. This line, however, is now abandoned through the greater part of its length.

Ohio Canals

The two State canals of Ohio cross the State from two different points of Lake Erie. The Ohio and Erie Canal, generally called the "Ohio Canal," runs from Cleveland to the Ohio at Portsmouth, a distance of about 309 miles. It is joined at Lockbourne by the Columbus navigable feeder, 11 miles in length. At Roscoe the old Walhonding Canal, which connects with the Ohio Canal, is still used for a distance of 6 miles. The other Ohio State canal is the Miami and Erie, connecting Toledo and Cincinnati, but does not now enter Ohio river. This canal has two feeders, one of which possesses some local importance. The total length of this canal is 244 miles.

Illinois Canals

The Illinois and Michigan Canal extends from Chicago to La Salle on the Illinois River and is 96 miles long. At La Salle the canal connects with the Illinois River through what is known as the "steamboat channel," a cut about half a mile long. Through its connection with the Illinois River, traffic can pass from Chicago to the Mississippi River at Grafton and thence to the Gulf of Mexico. The other State canal in Illinois is the Chicago Sanitary and Ship Canal, running from Chicago to Lockport, Ill., 28 miles. The immediate object of this work is to protect the waters of Lake Michigan from sewage pollution. The water was turned into the main channel in January, 1900. The projectors of this canal have contemplated that eventually it will form part of a great ship canal connecting the Lakes with the Mississippi.

Louisiana State Canal

The only State canal in Louisiana is the New Basin Canal, originally owned by the New Orleans Canal and Banking Company. In 1866 the canal reverted to the State. This canal is 7 miles in length and extends from Lake Pontchartrain to a point in the city of New Orleans, but it does not connect with the Mississippi.

LOCATION OF PRIVATE CANALS

Atlantic Coast System

With the exception of two unimportant canals in Louisiana all private canals in the United States are owned by corporations. The eastern group of these private canals may be classified under the general title of the "Atlantic Coast system of private canals." With but few exceptions they were all constructed before the outbreak of the civil war under charters granted by State legislatures, and either because of their control by railroads or by reason of a failure to maintain improvements, they are for the most part of declining importance and exert little, if any, appreciable influence on freight rates.

Of the 11 private canals composing the Atlantic Coast system, two—the Morris and the Delaware and Raritan—cross the State of New Jersey. The former has been practically abandoned, and transportation over the latter appears to be discouraged, by its lessee, the Pennsylvania Railroad. At one time in their history both these New Jersey canals played an important part in the transportation of coal to tidewater.

Of the elaborate system of canals constructed in Pennsylvania there remain the Lehigh Canal and the Delaware Division Canal. The Lehigh Coal and Navigation Company, the owner of the Lehigh Canal, also leases the Delaware Division Canal, but neither waterway possesses the importance it formerly occupied as a means of transporting coal to tidewater. The remaining privately owned inland waterway of Pennsylvania is the Schuylkill Navigation, partly canals and partly slack-water navigation in the Schuylkill River, operated by a private corporation entitled "The President, Managers and Company of the Schuylkill Navigation," which is empowered to

collect tolls. As shown by the schedule of this company, received by the Bureau of Corporations, practically all of its capital stock is owned by the Reading Company.

The Chesapeake and Delaware Canal, about 14 miles in length, connects the Delaware River and Chesapeake Bay, and forms an important "inside" water route between the North and South. In 1917 the War Department, on the recommendation of a Congressional commission, advised the purchase of this canal by the Government.

The historic Chesapeake and Ohio Canal, with which the name of George Washington is closely associated, extends from Georgetown, D. C., to Cumberland, Md., 185 miles. It is now controlled by the Baltimore and Ohio and Western Maryland Railroads, although the Government owns a considerable amount of stock in the canal company. The Chesapeake and Ohio Canal has lost much of its former importance, being now used mainly by a coal company and its subsidiary towing concern.

The four canals in Virginia and North Carolina are so closely connected that they may be considered together. All are owned by private companies, and so far as the Bureau of Corporations has been able to learn none of them is owned by railroads. These canals are as follows:

The Albemarle and Chesapeake Canal connects Chesapeake Bay with Albemarle Sound and forms part of a through waterway about 65 miles long, composed of Elizabeth River, the Virginia and North Carolina cuts of the canal, North Landing River, Currituck Sound, Coinjock Bay, Upper North River, and Lower North River. The canal proper is 14 miles in length.

The Dismal Swamp Canal, an old waterway, is fed from Lake Drummond and passes through what was originally the Dismal Swamp, from which a large tract of land has been reclaimed by drainage. The canal proper is about 22 miles long, 14 of which are in the State of Virginia and 8 miles in North Carolina. The Dismal Swamp Canal connects the Chesapeake Bay and Albemarle Sound, forming part of a through waterway about 67 miles long, composed of Elizabeth River, Deep Creek, Dismal Swamp Canal, Turners Cut, Upper Pasquotank and Lower Pasquotank rivers.

The Fairfield Canal, 4 miles in length, and the Newbern and Beaufort Canal (formerly the Chinkoot and Harlowe Canal), about 3 miles long, are both unimportant local waterways. The Fairfield Canal connects the Alligator River and Mattamuskeet Lake, while the Newbern and Beaufort Canal connects Chinkoot Creek and Harlowe Creek, forming part of a waterway about 20 miles long between Newbern and Beaufort, N. C., composed of Neuse River, Chinkoot Creek, the canal, and Harlowe Creek and Newbern River. The Newbern and Beaufort Canal is owned by the Albemarle and Chesapeake Canal Company, which is also interested in the Fairfield Canal.

Louisiana Waterways

The four private canals of Louisiana that are of sufficient importance to warrant mention in this connection radiate from points in or near New Orleans. Two connect Mississippi River with other natural waterways. None of them is over 7 miles in length, although several of them, in conjunction with natural waterways, afford routes several

miles longer. There are a number of other very short canals in Louisiana, but they are of a purely local character. The four principal private canals of Louisiana are the Carondelet (Old Basin), connecting the city of New Orleans and Lake Pontchartrain by means of a waterway composed of the canal and Bayou St. John; Lake Borgne Canal connecting Lake Borgne and the Mississippi River; the Barataria and La Fourche (Company) Canal, connecting the Mississippi River and various interior streams and projected to Morgan City; and the Harvey Canal, running from the Mississippi River to Bayou Barataria. Of these four canals the Barataria and La Fourche Canal and the Harvey Canal are owned by private individuals. The other two private canals are owned, respectively, by the Carondelet Canal and Navigation Company and the Lake Borgne Canal Company.

Other Canals

The Oregon City locks, situated on the Willamette River between Oregon City and Portland, were formerly owned by the defunct Willamette Falls Canal and Locks Company. This improvement is now owned by the Portland General Electric Company. The toll collector is jointly paid by the General Electric Company and the Oregon Railroad and Navigation Company (Southern Pacific), pointing both to the use of the canal as a water power and its possible control by a railroad.

The Cape Cod Canal, now in course of construction, will shorten the distance between Boston and New York, and is expected to increase the importance now attached to the present Atlantic Coast system of private canals.

STATISTICS OF CANALS IN OPERATION

Detailed statistics of canals are set forth in the following tables, entitled respectively "Government canals," "State canals in operation," and "Private canals in operation." These statistics have been compiled from various sources, including the reports of the United States Engineers, the reports of the United States Census, and information furnished directly to the Bureau of Corporations. The data from different sources was often conflicting; and while much care has been exercised in selecting the latest reliable statements it is possible that some errors may be found.

Some variations will be noticed in the data for the different groups of canals. But as far as possible the tables show the location of the canals, the principal dimensions of the canals and locks, the period of navigation and the traffic for selected years. The total expenditures or the cost of construction and improvements are shown as far as the figures are available; and in the case of most of the private canals further information as to capitalization, receipts, and expenses are given. In all of the tables the last column of "Remarks" sets forth important facts concerning the various canals.

As shown by the tables there are 17 Government canals aggregating 194.49 miles in length, 12 State canals aggregating 1,358.98 miles, and 16 private canals aggregating 635.58 miles; a total of 45 canals with a length of 2,189.05 miles.

TABLE 30.—Government canals

Name	Points connected	Dimensions: Length	Depth	Bottom width	Locks: Number	Length	Width	Number of lift bridges	Traffic: Year	Number of tonnage	Tonnage	Total Government expenditure to June 30, 1907	Remarks
GREAT LAKES		Miles	Feet	Ft.		Ft.	Feet	Miles			Tons		
St. Clair Flats Canal	Various flats in St. Clair River, Mich. (map)	1.30	20.0	200	0				1903 1906		31,320,071 40,500,441	$1,004,910.00	The present improvement dates from 1899 and includes a straight, dredged cut across a flat where the depth was only about 6 feet.—Report of Chief of Engineers, 1906, pp. 672-673; Appendix P P 5, p. 1981.
St. Marys Falls Canal	Lake Superior, Lake Huron	1.0	19.0 to 21.0	93	2			4	1904 1905	15,153,34 18,500,41	34,395,000 37,370,000	$8,000,000.00	Traffic given through American canal only. Canal begun by Michigan in 1853 and completed 1855, at a cost of $1,000,000, proceeds of 750,000 acres granted by Congress. In 1870 Congress began to improve canal, completing the Weitzel lock in 1881 and the Poe lock in 1896. Michigan relinquished control in 1881. Traffic through this canal affords a key to the commerce of the Lake Superior division of the lake system. All traffic going to or coming from Lake Superior must pass through the St. Marys Falls Canals. Since 1890 business through this canal has been greatly developed by reason of the exploitation of the iron mines of the Lake Superior region. Traffic: Iron ore, coal, wheat, lumber, flour.—Report of Chief of Engineers, 1908, pp. 667-668; Appendix, pp. 1879-1879.
	Weitzel Lock			1.5		400	80.0	80	1906	15,033	43,013,100		
	Poe Lock			22		770	100						
Portage Lake Canals	Keweenaw Bay, Lake Superior	1.75	18.0	30	0			8	1905 1906	3,757 3,007	9,413,440 9,404,414	$1,000,470.00	The total waterway is 23 miles in length. This improvement is also used as a harbor of refuge, especially during the stormy season in the fall of the year.
Duluth Canal				30					1906	8,814	21,900,033	$1,170,400.00	Expenditures are the total for Duluth-Superior harbor and St. Louis Bay.
Wisconsin Entry									1906	9,071	7,884,000		
Sturgeon Bay Canal	Sturgeon Bay, Lake Michigan	1.30	10.0	91	0			8	1905 1906	9,830 9,000	1,814,710 1,470,000	$430,000.00	It is believed the project has a material effect in controlling freight rates on bulk commodities, such as coal, grain, and lumber. Lake Michigan is separated from Sturgeon Bay, an arm of Green Bay, by a neck of land 12 miles wide. The Sturgeon Bay and Lake Michigan Ship Canal and Harbor Co., from 1872 to 1881, built a canal without locks or gates, and the United States assumed control April 25, 1893.—Report of Chief of Engineers, 1906, pp. 584-585; Appendix K K 5, pp. 1736-1741.
	Westerly 1,000 feet		8.0										

TABLE 56—*Government canals*—Continued

Name.	Points connected.	Dimensions. Length.	Dimensions. Width.	Dimensions. Depth.	Locks. Number.	Locks. Length.	Locks. Width.	Period of navigation.	Traffic. Year.	Traffic. Number of vessels.	Traffic. Freight.	Total Government expenditure to June 30, 1907.	Remarks.
GREAT LAKES cont'd.		*Miles*	*Feet*	*Ft.*		*Ft*	*Feet*	*Mo.*			*Tons.*		
Portage Canal	Fox River-Wisconsin River.	2.00	100	4	1	145	35						
Benton Harbor Canal	Upper part of harbor-Town of Benton Harbor.	.89	98	18	0				1904 1905 1906	1,239 1,373 1,323	97,036 118,412 115,839	[1]$889,339.85	The traffic benefited by this improvement is a limited one, principally carrying of passengers and fruit. The entire traffic is served by one line of steamers, which during the summer months runs from two to four boats daily, some of these being of very great size.—Report of Chief of Engineers, 1906, pp. 617-618.
MISSISSIPPI VALLEY.													
Illinois and Mississippi Canal.	Illinois River-Mississippi River.	95.80	80	7	33	170	35					7,188,696.87	This canal has been recently completed. The object of the improvement is to provide a link in a waterway from Lake Michigan to Mississippi River at mouth of Rock River, Ill.—Report of Chief of Engineers, pp. 610, 469; Appendix M M 3, p. 1785.
Des Moines Rapids Canal.	Keokuk, Iowa-Point 7.5 miles above Keokuk.	7.60	250	5	3	325	78.5	8	1905-1906 1906-1907	816 1,143		1,262,010.58	Traffic 1906-7: 13,499 tons merchandise, 12,271 bushels grain, 7,358,000 ft. lumber, 6,700,000 ft. logs, 4,332,000 laths, 1,300,000 shingles. Owing to high water many rafts and boats passed over the rapids instead of through the canal. Report of Chief of Engineers, 1907, p. 494.
Louisville and Portland Canal.	Louisville-Portland, Ky.	2.50	90	8	2	350	80	12	1899-1900 1900-1901 1901-1902 1902-1903 1903-1904 1904-1905 1905-1906 1906-1907	 4,727 5,821 5,342	1,281,798 1,127,587 847,622 984,332 1,557,391 732,607 1,053,526 1,079,534	4,034,587.02	During the fiscal year 1906-7, 1,545 boats, etc., passed over the falls via the open-river channel, carrying 453,792 tons of freight, the aggregate passing Louisville via both routes being 6,890 boats, etc., carrying 1,436,673 tons of freight.—Report of Chief of Engineers, 1907, p. 576.
Tennessee River Canals:													
Colbert and Bee Tree.	Around Colbert Shoals between Florence and Riverton, Ala.	8.00		7	1	340	80					1,700,000.00	Commerce carried on the river between Florence and Paducah during calendar year 1906 amounted to 766,118 tons, valued at $10,930,300, being general merchandise, forest products, and farm products.—Report of Chief of Engineers, 1906, pp. 502-503.

Muscle Shoals	Around Big Muscle Shoals and Little Muscle Shoals	14.30	110	5	0	365	00		1888 1890	759 838	17,700 30,878	4,900,000.00	Muscle Shoals Canal opened to navigation in 1890. It is in two sections. A railroad about 15 miles long is operated in connection with the maintenance of the canal.
Elk River Shoals	Around Elk River Shoals	3.70		5	9	365	00						The commerce on the river between Chattanooga and Florence during 1903 amounted to 415,751 tons, valued at $16,146,856, being general merchandise, farm products, and forest products.—Report of Chief of Engineers, 1906, pp. 499-500.
ATLANTIC AND GULF COAST													
Katherville Minim Creek Canal	Katherville Minim Creek, South Carolina	5.00	50	0	0			12	1884 1885		249,000 390,300 247,300	347,782.00	This canal forms part of the waterway composed of the Santee River and the canal. The present project, adopted in 1880, provides an outlet for the river into Winyah Bay by constructing the canal and snagging the river, at an estimated cost of $350,000. The first cut of the canal has been made entirely through, and has been widened through a portion of its length. Canal was built in 1879.—Report of Chief of Engineers, 1906, pp. 282-283. No information available as to effect of improvement on freight rates.
Port Arthur Canal	Taylors Bayou to Sabine Pass	7.13	300	12	0				1903 1906		1,770,034 1,014,380		This canal was transferred to the United States free of cost, December 13, 1906. The United States Census reports the cost of construction at $893,490.
Galveston and Brazos Canal	Oyster Bay Brazos River	30.30	35.40	3	0				1900	355		67,300.00	The United States purchased this canal in December, 1902, at a cost of $30,000. Six miles of its length is through Christmas Bay and Oyster Creek. Adopted project contemplates a depth of 5 feet.—Report of Chief of Engineers, 1906, pp. 420-421. The United States Census reports the cost of construction at $369,098.
Morgan Canal	Galveston Bay Buffalo Bayou	5.43	180	17	0			12	1905 1906	1,598	104,007 132,106		This is a link in the water route from Houston to Galveston, which is stated to have a marked influence on freight rates between points on that route and points on the seaboard and in the interior. In 1902 the Government purchased the Morgan Cut and Canal for $99,316.85.—Report of Chief of Engineers, 1906, pp. 415-417; Appendix U 5, p. 1338. The United States Census reports the cost of construction at $271,975.
PACIFIC COAST													Expenditures include work in removing obstructions from the river channel below the Cascades.
Cascades Canal	Around the Cascades in Columbia River, Oreg.	57		8	9	400 to 400	00	12	1895-1900 1900-1907	1,417 1,204	40,884 53,770	3,890,000.00	The head of navigation for boats passing the locks is now Big Eddy, formerly Three Mile Rapids, 14 miles above The Dalles. Report of Chief of Engineers, 1906, pp. 747-750, Appendix VV., 11-19.

a Expenditures include that for St. Joseph harbor and river.

TABLE 57—*State canals in operation*

Name.	Route.	Dimensions				Locks.			Period of navigation.	Freight tonnage, 1906.	Cost of construction.	Remarks.
		Length.	Width. Top.	Width. Bottom.	Depth.	No.	Length.	Width.				
		Miles.	*Feet.*	*Feet.*	*Ft.*		*Feet.*	*Ft.*	*Months.*			
Erie Canal	Albany to Buffalo, N. Y.	351.78	70	56.00	7	72	110	18	7	2,385,491	$65,402,033	First canal completed 1825; enlarged 1835-62. There are 8 feeders and 18 aqueducts. Tolls first levied July, 1820, and abolished 1882. There are 3 guard locks, making total number of locks 75. "Double headers," or boats traveling tandem, can be passed through 38 lengthened locks without uncoupling.
Navigable feeders		3.35										
Champlain Canal	Whitehall to West Troy, N. Y.	66.00	50	35.00	5	20	110	18	7	740,983		The enlargement of the Champlain Canal was begun in 1860, but was never completed.
Glens Falls feeder		12.00	40	26.00	4	12	90	15				
Pond above Troy dam		3.00										
Black River Canal and feeder	Rome to Lyons Falls, N. Y.	48.80	42	26.00	4	109	90	15	6	77,331	3,964,000	
Black River Improvement.		42.50				2	160	30				
Oneida River Improvement.	Brewerton to Three River Point, N. Y.	20.00	80	60.00	4½	2	120	30			368,164	
Oneida Lake Canal and feeders (new).	Higgins to Oneida Creek, N. Y.	6.00	70	47.25	7	6	110	18			450,678	
Oswego Canal	Oswego to Syracuse, N. Y.	38.00	70	52.50	7	18	110	18	7	172,228	5,161,793	18 miles slackwater.
Seneca River Towing Path.	Baldwinsville to Oswego Canal at Mud Lock, N. Y.	5.00	40	24.00	4	1	90	15				
Baldwinsville Canal		1.00										
Cayuga and Seneca Canal	Geneva to Montezuma, N. Y., connecting Seneca Lake with Erie Canal.	23.00	70	52.50	7	11	110	18	7	164,874	2,232,632	Cayuga and Seneca Canal was enlarged in 1862. 10½ miles slackwater.
Cayuga Inlet		2.00	70	52.50	7	1	110	18				
Total for New York		622.43				254				3,540,907	77,579,300	Including 96 miles of river improvement.

Ohio and Erie Canal	Cleveland to Portsmouth, Ohio	[illegible]	[illegible]	[illegible]	4	144	[illegible]	[illegible]			
Columbus feeder	Lockbourne to Columbus, Ohio	11 [illegible]	[illegible]	[illegible]	4				[illegible]	1,[illegible]	Dayton [illegible] and [illegible] show diversion in millions from [illegible] to [illegible]
Other navigable feeders		8 [illegible]									
Miami and Erie Canal, Cincinnati-Dayton division	Toledo to Cincinnati, Ohio	[illegible]	[illegible]	[illegible]	4	53	[illegible]	[illegible]			
Dayton-Defiance division		1[illegible]	[illegible]	[illegible]	8	13	[illegible]	[illegible]	[illegible]	[illegible]	
Defiance-Toledo division		[illegible]	[illegible]	[illegible]	8						
Feeders		[illegible]									
Total for Ohio		[illegible]				[illegible]			[illegible]	[illegible]	
Illinois and Michigan Canal	Chicago to La Salle, Ill	[illegible]	[illegible]	[illegible]	8	1[illegible]	[illegible]	[illegible]	8,[illegible]	8,[illegible]	Undertaken by Illinois to connect Mississippi River with Lake Michigan at Chicago. Recommended in 1808 by Albert Gallatin in report to Congress. In 1827 Congress donated to Illinois 300,000 acres of land for canal purposes. Length includes 5.55 miles of river.
Chicago Sanitary and Ship Canal	Chicago to Lockport, Ill	[illegible]	[illegible]	[illegible]	[illegible]					[illegible]	Length includes 5.30 miles of river.
Total for Illinois		1[illegible]				1[illegible]			8,[illegible]	[illegible]	
New Basin Canal and Shell Road	New Orleans, La., to Lake Pontchartrain	[illegible]	[illegible]		[illegible]				[illegible]	1,[illegible]	
Total for Louisiana		[illegible]							[illegible]	1,[illegible]	
Grand total of State canals		1,[illegible]				[illegible]			[illegible]	[illegible]	

TABLE 57—*State canals in operation*

Name.	Route.	Dimensions				Locks.			Period of navigation.	Freight tonnage, 1906.	Cost of construction.	Remarks.
		Length.	Width. Top.	Width. Bottom.	Depth.	No.	Length.	Width.				
		Miles.	*Feet.*	*Feet.*	*Ft.*		*Feet.*	*Ft.*	*Months.*			
Erie Canal	Albany to Buffalo, N. Y	351.78	70	56.00	7	72	110	18	7	2,385,491	$65,402,033	First canal completed 1825; enlarged 1835-62. There are 8 feeders and 18 aqueducts. Tolls first levied July, 1820, and abolished 1882. There are 3 guard locks, making total number of locks 75. "Double headers," or boats traveling tandem, can be passed through 38 lengthened locks without uncoupling.
Navigable feeders		3.35										
Champlain Canal	Whitehall to West Troy, N. Y.	66.00	50	35.00	5	20	110	18	7	740,983		The enlargement of the Champlain Canal was begun in 1860, but was never completed.
Glens Falls feeder		12.00	40	26.00	4	12	90	15				
Pond above Troy dam		3.00										
Black River Canal and feeder	Rome to Lyons Falls, N. Y.	48.80	42	26.00	4	109	90	15	6	77,331	3,964,000	
Black River Improvement.		42.50				2	160	30				
Oneida River Improvement.	Brewerton to Three River Point, N. Y.	20.00	80	60.00	4½	2	120	30			368,164	
Oneida Lake Canal and feeders (new).	Higgins to Oneida Creek, N. Y.	6.00	70	47.25	7	6	110	18			450,678	
Oswego Canal	Oswego to Syracuse, N. Y.	38.00	70	52.50	7	18	110	18	7	172,228	5,161,793	18 miles slackwater.
Seneca River Towing Path.	Baldwinsville to Oswego Canal at Mud Lock, N. Y.	5.00	40	24.00	4	1	90	15				
Baldwinsville Canal		1.00										
Cayuga and Seneca Canal	Geneva to Montezuma, N. Y., connecting Seneca Lake with Erie Canal.	23.00	70	52.50	7	11	110	18	7	164,874	2,232,632	Cayuga and Seneca Canal was enlarged in 1862. 10½ miles slackwater.
Cayuga Inlet		2.00	70	52.50	7	1	110	18				
Total for New York		622.43				254				3,540,907	77,579,300	Including 96 miles of river improvement.

Ohio and Erie Canal	Cleveland to Portsmouth, Ohio	[illegible]	[illegible]	[illegible]	4	144	[illegible]	[illegible]		[illegible]	[illegible]	Census reports [illegible] and [illegible] show decrease in mileage from [illegible] to 817.
Columbus feeder	Lockbourne to Columbus, Ohio	11 [illegible]	[illegible]	[illegible]	4					[illegible]	[illegible]	
Other navigable feeders		[illegible]										
Miami and Erie Canal:	Toledo to Cincinnati, Ohio											
Cincinnati-Dayton division		[illegible]	[illegible]	[illegible]	4	33	[illegible]	[illegible]				
Dayton-Defiance division		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	
Defiance-Toledo division		[illegible]	[illegible]	[illegible]	[illegible]							
Feeders		[illegible]										
Total for Ohio		[illegible]				[illegible]				[illegible]	[illegible]	
Illinois and Michigan Canal	Chicago to La Salle, Ill	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]	[illegible]	Undertaken by Illinois to connect Mississippi River with Lake Michigan at Chicago. Recommended in 1808 by Albert Gallatin in report to Congress. In 1827 Congress donated to Illinois 300,000 acres of land for canal purposes. Length includes 5.55 miles of river.
Chicago Sanitary and Ship Canal	Chicago to Lockport, Ill	[illegible]	[illegible]	[illegible]	[illegible]						[illegible]	Length includes 5.80 miles of river.
Total for Illinois		[illegible]				[illegible]				[illegible]	[illegible]	
New Basin Canal and Shell Road	New Orleans, La., to Lake Pontchartrain	[illegible]	[illegible]		[illegible]					[illegible]	[illegible]	
Total for Louisiana		[illegible]								[illegible]	[illegible]	
Grand total of State canals		[illegible]				[illegible]				[illegible]	[illegible]	

TABLE 58 A—*Private canals in operation*

Name of canal and owner.	Points connected.	Dimensions. Length.	Dimensions. Width. Top.	Dimensions. Width. Bottom.	Dimensions. Depth.	Locks. No.	Locks. Length.	Locks. Width.	Period of navigation.	Traffic. Year.	Traffic. Number of vessels.	Traffic. Tons of freight.	Remarks.
NEW JERSEY.		*Miles.*	*Feet.*	*Feet.*	*Ft.*		*Ft.*	*Ft.*	*Mos.*				
Delaware and Raritan Canal (United New Jersey Railroad and Canal Co.).	Bordentown and New Brunswick, N. J.	44.00	80	40	8-9	13	210	23½	10	1897	.....	595,375	In May, 1871, the canal was leased to the Pennsylvania R. R. for 999 years, and since that date it has been operated by that road. The lessee engages to pay 10 per cent per annum on the total stock of the united companies ($5,847,500). The canal is well built throughout, with paved banks and steam-operated lock gates. The new Pennsylvania Railroad bridge at New Brunswick now prevents the passage of masted vessels.
										1898	.....	546,083	
										1899	.....	606,961	
										1900	.....	584,112	
Feeder (Raven Rock to junction with canal) at Trenton, N. J.	.....	22.00	.....	.....	.....	.....	.....	.....	.....	1901	.....	513,531	
										1902	.....	473,375	
										1903	.....	422,492	
										1904	3,326	464,518	
										1905	4,012	441,735	
										1906	.....	395,753	
Morris Canal (Morris Canal and Banking Co.)	Phillipsburg, N. J. to Jersey City, N. J.	102.00	45	25	5	23	88	20	7	1897	.....	231,870	This canal has also 23 inclined planes; 52 boats operating on the canal in 1905.
										1898	.....	191,287	
										1899	.....	173,555	
										1900	.....	125,829	
										1901	.....	122,786	
Lake Hopatcong feeder	.....	.70	.....	.....	.....	.....	.....	.....	.....	1902	.....	27,392	
Pompton feeder	.....	4.00	.....	.....	.....	.....	.....	.....	.....	1903	.....	76,165	
										1904	.....	84,380	
										1905	.....	75,631	
										1906	.....	88,773	
PENNSYLVANIA.													
Lehigh Canal. (Lehigh Coal and Navigation Co.)	Mauch Chunk to Easton, Pa.	48.00	60-100	45	6	58	100	22	8	1840	.....	281,802	Length includes 12 miles of slackwater. Freight tonnage since 1890 includes the Delaware Division Canal; 196 boats operating in 1905.
										1850	.....	884,783	
										1860	.....	1,338,375	
										1870	.....	1,123,140	
										1880	.....	719,338	
										1890	.....	603,662	
										1900	.....	380,579	
										1905	.....	190,752	
										1906	.....	240,625	

| | | |

TABLE 58 A—*Private canals in operation*—Continued

Name of canal and owner.	Points connected.	Dimensions.				Locks.			Period of navigation.	Traffic.			Remarks.
		Length.	Width. Top.	Width. Bottom.	Depth.	No.	Length.	Width.		Year.	Number of vessels.	Tons of freight.	
VIRGINIA AND NORTH CAROLINA.		*Miles.*	*Feet.*	*Feet.*	*Ft.*		*Ft.*	*Ft.*	*Mos.*				
Dismal Swamp Canal (Lake Drummond Canal, Lake Drummond Canal and Water Co.)	Deep Creek, Va., to South Mills, N. C.	22.15	60	40	9	2	250	39	12	1880 1889 1901	....	6,731 78,211 214,263	
Gilmerton Level		3.46								1906	3,915	388,488	
Albemarle and Chesapeake Canal (Albemarle and Chesapeake Canal Co.).	Chesapeake Bay to Albemarle Sound.	11.00	80	60	9	1	220	40	12	1889 1890 1902 1903 1904 1905 1906	.... 3,325 .... 3,127 3,088	316,793 403,111 199,062 203,812 144,041 88,580 95,269	Principal article carried is lumber. The two links or cuts of this canal are parts of the inland water route from Norfolk to Albemarle Sound via Currituck Sound.
Fairfield Canal (Fairfield Canal and Turnpike Co.).	Fairfield, N. C., to Alligator River.	4.00	26–40	.....	6				12				Passes through a rich farming country and has important local influence.
Newbern and Beaufort Canal.	Harlowe Creek to Clubfoot Creek, N. C.	3.20	30	.....	5					1905 1906	....	83,667 81,770	
LOUISIANA.													
Old Basin Canal (Carondelet Canal and Navigation Co.).	New Orleans, La., to Lake Pontchartrain.	2.50	55–65	.....	7				12	1904 1905	1,683 1,703	34,850	This canal will shortly revert to the State. Date expiration of charter is in dispute. St. L. & S. F. R. R. said to be interested in canal. Exempt from taxation.
Barataria and La Fourche Canal.	New Orleans to Houma, La. (projected to Morgan City).	7.00	45	.....	6	1	160	25	12				Owned by an individual, and there is no charter. Very little traffic except small luggers carrying fish and vegetables to the New Orleans market.
Harvey's Canal (Harvey Canal, Land, and Improvement Co.).	New Orleans, La., to Bayou Barataria.	5.35	70	.....	6	1	184	30	12				Mostly operated on by oyster boats and skiffs carrying vegetables, fish, etc. If lock connecting Mississippi River is built and canal dredged deeper it may be a factor in reducing railroad rates.
Lake Borgne Canal (Lake Borgne Canal Co.).	New Orleans, La., to Lake Borgne.	7.00	80	.....	7	1	200	40					Soon after organization, Lake Borgne Canal in 1900 was leased for twenty-five years to Southern Improvement Co., which went into hands of receivers, by whom canal is now operated. Little or no business. Canal about 10 miles below New Orleans.

TABLE 58 P.—*Private canals in operation*

Name of canal and owner.	Cost of construction and improvements.	Capital stock.		Funded indebtedness.	Year.	Receipts.	Expenses.	Net earnings (or deficit).	Dividends.	
		Authorized.	Issued.						Amount.	Rate.
NEW JERSEY.										*Per cent.*
Delaware and Raritan Canal (United New Jersey R. R. and Canal Co.)	$5,113,749	.....	$5,847,400	.....	1904	$268,564	$378,484	[a] $109,920	.....	.....
					1905	298,937	413,382	[a] 114,444	.....	.....
					1897	167,411	.....	.....	[d] $118,628	10 and 4
Morris Canal (Morris Canal and Banking Co.)	[b] 6,000,000	[c] $2,200,000	[c] 2,200,000	$556,835	1902	52,076	.....	.....	[d] 118,628	10 and 4
					1904	96,231	162,442	[a] 66,211	[d] 118,628	10 and 4
					1905	86,155	163,658	[a] 174,503	[d] 118,628	10 and 4
PENNSYLVANIA.										
Lehigh Canal (Lehigh Coal and Navigation Co.)	[b] 4,455,000	.....	.....	.....	1860	481,119	.....	.....	.....	.....
					1870	344,308	182,343	161,965	.....	.....
					1880	187,520	78,854	108,666	.....	.....
					1899	[f] 83,068	[e] 139,189	[a] 56,100	.....	.....
					1905	[f] 44,640	[e] 219,388	[a] 174,748	.....	.....
Delaware Division Canal (Delaware Division Canal Co.)	2,433,350	2,400,000	1,633,350	800,000	1830–40	[f] 94,848	48,062	.....	.....	.....
					1840–50	[f] 55,487	.....	.....	.....	.....
					1855	388,914	.....	.....	.....	.....
					1856	353,782	83,355	270,427	.....	.....
					1850–60	[f] 274,024	61,152	212,872	.....	.....
					1866	349,650	81,316	268,334	.....	.....
					1870	221,704	149,509	72,195	.....	.....
Schuylkill Navigation (Schuylkill Navigation Co.)	11,018,875	.....	[g] 3,962,262	8,494,872	1865	1,650,882	1,401,431	249,451	.....	.....
					1869	1,159,059	344,428	814,631	.....	.....
					1880	537,133	169,952	403,181	.....	.....
					1899	.....	.....	.....	None.	.....
					1900	.....	.....	.....	None.	.....
					1901	.....	.....	.....	None.	.....
					1902	.....	.....	.....	None.	.....
					1903	.....	.....	.....	None.	.....
					1904	61,533	117,257	[h] 55,724	None.	.....
					1805	65,725	68,722	[h] 2,996	None.	.....
					1906	.....	.....	.....	.....	.....
MARYLAND.					1876	237,616	85,727	151,889	104,118	4
					1880	201,783	62,245	139,538	104,118	4
					1889	189,117	51,786	137,331	104,118	4
Chesapeake and Delaware Canal (Chesapeake and Delaware Canal Co.)	4,000,000	.....	1,903,238	2,602,950	1900	.....	.....	.....	104, 18	4
					1901	.....	.....	.....	104,118	4
					1902	.....	.....	.....	104,118	4
					1903	.....	.....	.....	104,118	4
					1904	154,319	53,543	100,776	104, 8	4
					1905	168,032	62,533	105,498	104,118	4
					1906	.....	.....	.....	104,118	4

Chesapeake and Ohio Canal (Chesapeake and Ohio Canal Co.)	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	None	
Virginia and North Carolina					[illegible]				[illegible]		
Dismal Swamp Canal (Lake Drummond Canal and Water Co.)	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]		
Albemarle and Chesapeake Canal (Albemarle and Chesapeake Canal Co.)	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Fairfield Canal (Fairfield Canal and Improvement Co.)	[illegible]										
Newbern and Beaufort Canal	[illegible]	[illegible]	[illegible]			[illegible]					
Georgia					[illegible]		[illegible]		[illegible]	[illegible]	[illegible]
Old Basin Canal (Brunswick Canal and Navigation Co.)	[illegible]	[illegible]	[illegible]	None	[illegible]				[illegible]		
Ocmulgee and La Grange Canal	[illegible]					[illegible]	[illegible]				
Harris Canal (Harris Canal, Land and Improvement Co.)						[illegible]					
Lake Dorgan Canal (Lake Dorgan Canal Co.)	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]			[illegible]		
Oregon					[illegible]	[illegible]	[illegible]	[illegible]			
Willamette Falls Canal (Portland General Electric Co.)	[illegible]				[illegible]	[illegible]	[illegible]	[illegible]			
Grand total	[illegible]		[illegible]	[illegible]							

ABANDONED CANALS

The extent to which State and private canals have been abandoned is strikingly shown by the Census Reports of 1880 and 1890. The report of 1880 shows that out of 4,468.60 miles of canals, costing approximately $214,041,802, 1,953.56 miles, representing a cost estimated at $44,013,166, had up to that time been abandoned. By 1889 the mileage so abandoned, as given in the Census report, had increased to 2,215.25 miles, or about half the total mileage originally built, representing a cost estimated at $51,171,016.[a]

Among the causes assigned for this wholesale abandonment of canals are the crisis of 1837, which put a stop to speculative canal building, the inability of some canals to compete with modern railroads and the mismanagement of other canals, together with a popular impression that such systems of public works had done more harm than good, and, finally, a belief that the chief means of internal communication was not to be water but rail.[b]

Since 1889 other important canals and sections of canals, both private and State, have fallen into disuse, including the Delaware and Hudson, in Pennsylvania and New York, important portions of the Pennsylvania system of public works, operated for some years by their purchaser, the Pennsylvania Railroad; the Santa Fe in Florida, and the Socola Canal in Louisiana in 1906. Assuming that the Census figures approximately reflect this tendency toward abandonment the total mileage abandoned brought down to date, as shown in the accompanying table, is 2,444.26 miles, representing a cost approximated at $81,171,374.

The location of these canals, together with other facts connected with their construction and operation, are generally indicated in the accompanying table, entitled "Important abandoned canals in the United States."

This table is divided into 8 columns. In the first column appears the name of the State where the abandoned canal was situated. In the second column is given the name of the abandoned canal, and in the third the points originally connected by the abandoned canal. Succeeding columns show the date of the construction of the canal, the date of its abandonment, its original length in miles and the cost of its construction. Finally, in the column under the head of "Remarks" are given the causes which are said to have led to the abandonment of the canal, with other facts regarding it.

[a] Tenth Census, 1880, Report on Transportation, p. 731; Eleventh Census, 1890, Report on Transportation by Water, p. 482.

[b] Hadley, Railroad Transportation, pp. 31–32.

TABLE XII — Abandoned canals in the United States

Transcribed from Report of New York canals 1901 and information received by the Bureau of Corporations

State	Name	Points connected	When built	When abandoned	Length	Cost of construction	Remarks
					Miles		
Maine	Cumberland and Oxford	Portland to Sebago Canal	1830; 1836	1870	30 (a)	$300,000 (a)	Abandoned because of construction of Portland and Ogdensburg R. R.
New Hampshire	Bear Falls	Around Bear Falls of the Merrimac	1815	1831	1	50,000 (a)	
	Hooksett Falls	Around Hooksett Falls of the Merrimac	1815-1820	1831	1/2	12,000 (a)	
	Amoskeag Falls	Around Amoskeag Falls of the Merrimac	1815-1820	1831	1 (a)	70,000 (a)	
	Cohos	Around several falls of the Merrimac	1815-1820	1831	2 (a)	70,000 (a)	
	Sewall's Falls	Around Sewall's Falls of the Merrimac	1815-1825	1831	3/4	15,000 (a)	
	Total				10 1/4	1,000,000 (a)	
Vermont	White River	Around falls of the Connecticut			20	100,000 (a)	The small canals of Vermont, together with South Hadley and Enfield Falls canals, also around falls in Connecticut River, single lock over navigable for more than 300 miles
	Waterquechy	Around falls of the Connecticut			20	100,000 (a)	
	Bellows Falls	Around falls of the Connecticut at Rockingham		1904	20	117,000 (a)	
	Total				1 40	317,000 (a)	
Massachusetts	Middlesex	Charlestown to Concord for barge team	1793-1804	1831	27 (a)	500,000 (a)	Abandonment of Middlesex Canal caused by construction of Boston and Lowell R. R.
	Pawtucket Falls	Around Pawtucket Falls in Merrimac River at Lowell	1795	1831	1 (a)	70,000 (a)	
	Enlarged		1813-1814 1825	1831			
	Montague	Around Montague Falls on Connecticut River	1793-1795		1 (a)	80,000 (a)	The Montague Canal comprised a series of locks around Montague Falls in Connecticut River; the South Hadley Canal, a series of locks around a 50 foot fall in Connecticut River at South Hadley
	South Hadley	South Hadley Falls Connecticut River			3 (a)	100,000 (a)	
	Hampshire and Hampshire	Southwick to Northampton	1827-1828	1831	33 (a)	1,000,000 (a)	
	Total				38 (a)	1,180,000 (a)	
Massachusetts Rhode Island	Blackstone	Providence to Worcester	1828-1829	1848	45 (a)	1,000,000 (a)	Abandonment of Blackstone Canal caused by construction of Providence and Worcester R. R. in 1844

a Consolidated into New Haven and Northampton Company in 1831.
b Total amount expended on canals to date of abandonment, $1,470,400 less value of property $300,000 leaving $1,170,400 loss.

TABLE 59—*Abandoned canals in the United States*—Continued.

State.	Name.	Points connected.	When built.	When abandoned.	Length.	Cost of construction.	Remarks.
					Miles.		
Connecticut	Farmington[a]	New Haven to Southwick	1825–1831	1846	56.00	[b] $600,000.00	Enfield Falls Canal comprised a series of locks and dams around Enfield Falls on Connecticut River. Now used to distribute water power.
	Enfield Falls	Around Enfield Falls, Connecticut River.	Before 1835	1850	5.50	125,000.00	
	Total				61.50	725,000.00	
New York	Chenango	Utica to Binghamton	1834–1836	1878	97.00	2,316,186.00	
	Chenango Extension	Binghamton to State Line of Pennsylvania.	1865	1878	40.00	1,600,889.00	
	Crooked Lake	Dresden to Penn Yan	1831–1833	1877	8.00	156,777.00	
	Chemung	Watkins to Elmira	1830–1833	1878	23.00	314,395.00	
	Feeder	Horseheads to Corning	1830–1833	1878	16.00		
	Genesee Valley	Rochester to Olean	1837–1857	1878	107.00	5,663,183.00	
	Branch	Shakers to Dansville	1838–1841	1878	11.00		
	Extension	Olean to Millgrove	1858–1861	1878	6.75		
	Junction	Elmira to Pennsylvania State line.	1852–1858	1871	[c] 13.00	530,637.00	
	Oneida Lake (old canal)	Oneida Lake to Higginsville	1835		4.50	78,824.00	
	New canal	Durhamville to Oneida Lake	1867–1877	1887	5.30	444,155.00	
	Erie (parts)				39.94		
	Delaware and Hudson	Honesdale, Pa., to Eddyville, N. Y.	1826–1828	[d] 1899	102.00	6,946,455.00	The report of the State engineer of New York for 1905, supplement, Vol. I, p. 751, states that Delaware and Hudson Canal was entirely abandoned soon after 1899. The United States Census, Bulletin No. 91, on Transportation by Water, reports that 9 miles of this canal (from Eddyville to High Falls) was in operation in 1906; 18 boats were reported in service, carrying 87,000 tons of freight.
	Total				459.81	18,051 501.00	
New Jersey	Penn's Neck Canal	Delaware River to Salem Creek	1800–1872	1880–1890	2.02	41,000.00	Sediment from this canal stopped navigation of Salem Creek. Government dredged creek, which continued to fill up.
Pennsylvania	Pennsylvania Canal:						
	Upper North Branch	Wilkes Barre to Athens	1836–1850	1865	102.75	5,643,491.00	
	Lower North Branch, Northern division. Also called Wyoming Valley.	Northumberland to Wilkes Barre.	1832	1899	60.00	2,000.000.00	
	Juniata division:						
	First part	Junction where Juniata flows into Susquehanna to Huntingdon.	1827–1834	1890	89.80	3,575,966.00	The remains of the entire system of the Pennsylvania Canal were abandoned in 1901.
	Second part	Huntingdon to Hollidaysburg.	1827–1830	[e] 1874	20.50		

Western division	Johnstown to Gallitzin	[illegible]	[illegible]	[illegible]	[illegible]	
West Branch division	Northumberland to Clearfield	[illegible]	[illegible]	[illegible]	[illegible]	
Eastern division	Columbia to Duncans Island	[illegible]	[illegible]	[illegible]	[illegible]	
Half Eagle Creek extension	Chamberton to Bellefonte	[illegible]	[illegible]	[illegible]	[illegible]	
Susquehanna division	Clarks Ferry to Northumberland	[illegible]	[illegible]	[illegible]	[illegible]	
Wyoming Branch	Clarks Ferry to Milnesbury	[illegible]	[illegible]	[illegible]	[illegible]	Wyoming Canal sold before completion to Pennsylvania R. R.
Beech Creek	Bellefonte to Erie	[illegible]	[illegible]	[illegible]		The Beech Creek Canal also included about 18 miles of slack water making a total of about [illegible] miles.
Erie division	Franklin on Allegheny River to Conneaut Lake	[illegible]	[illegible]	[illegible]	[illegible]	
Beaver	City Mills to New Castle on Shenango	[illegible]	[illegible]	[illegible]	[illegible]	The Beaver Canal included 33 miles of slack water in addition to the canal mileage.
Erie Extension	New Castle to Erie on Lake Erie	[illegible]	[illegible]	[illegible]	[illegible]	The Erie Extension included 18 miles of canal and 10 miles of slack water.
Delaware and Hudson (See New York)						
Union Canal	Middletown to Reading	[illegible]	[illegible]	[illegible]	[illegible]	The remains of the entire system of the Union Canal, Pa., totalling a cost of $8,[illegible], were abandoned in [illegible]. See contents, [illegible]. The Union Canal Co. proposed the consolidation of Schuylkill and Susquehanna Navigation Co. (open [illegible] 1[illegible]), with the Delaware and Schuylkill Canal and Navigation Co., completed 1[illegible]. The cost of consolidated includes 4 miles of railway.
Union Canal, Pine Grove Branch	Union Furge to Pine Grove	[illegible]	[illegible]	[illegible]	[illegible]	
Susquehanna and Tidewater	Columbia (Maryland State Line near Iddo), Canals of Pennsylvania, p. 171 Harris de Grace, Md.	[illegible]	[illegible]	[illegible]	[illegible]	Susquehanna and Tidewater canal based to Philadelphia and Reading Railroad in 1[illegible] for [illegible] years. 18 miles of this canal were in Maryland, 9 miles of slack water giving total of 48 miles.
Muncy Canal	Muncy to West Branch of Pennsylvania Canal		[illegible]	[illegible]	[illegible]	
Lancaster Canal	Lancaster to State Station	[illegible]	[illegible]	[illegible]	[illegible]	
Codorus Nav. Canal	York to Susquehanna River			[illegible]		
Lackawaxen	See Delaware and Hudson Canal					
Lehigh Coal and Navigation (Part of [illegible])	Stoddartsville to Mauch Chunk	[illegible]	[illegible]	[illegible]		

[a] Consolidated into New Haven and Northampton Company in [illegible].
[b] Total amount expended on canals to date of abandonment, $1,[illegible], less value of property, $[illegible]. Leasing $1,[illegible] 4[illegible] lines.
[c] Two miles in State of Pennsylvania.
[d] Enlarged 1844, 1845, and 1874.
Abandoned 1874 in part; now wholly abandoned.
[e] Abandoned [illegible] in part; now wholly abandoned.

[f] Pa. [illegible]
[g] Pa. [illegible]
[h] Pa. [illegible]
[i] Pa. [illegible]
[j] Pa. [illegible]
[k] Pa. [illegible]
[l] Lifting inclined.
[m] 8 miles of slack water.

TABLE 59— *Abandoned canals in the United States*—Continued

State.	Name.	Points connected.	When built.	When abandoned.	Length.	Cost of construction.	Remarks.
					Miles.		
Pennsylvania	Schuylkill Navigation (part).	Port Carbon to Port Clinton			18.35		
	Total				908.74	$34,750,265.00	
Ohio.	Sandy and Beaver	Bolivar, Ohio, to Smiths Ferry.	1835-1846	1852	73.50	1,500,000.00	This canal was killed by the competition of the Pittsburg, Fort Wayne and Chicago and the Cleveland and Pittsburg railroads.
	Ohio and Pennsylvania	Akron to Pennsylvania State Line.	1838		87.00	1,000,000.00	Ohio and Pennsylvania Canal was designed to connect those of Ohio with the canal system of Pennsylvania, and was a costly failure.
	Athens Branch (part)	Nelsonville to Athens			14.00		
	Lebanon Branch	Middletown to Lebanon	1836-1840	1859	17.00	217,752.00	
	Hocking	Carroll to Nelsonville	1836-1844	1895	42.00	975,481.00	
	Hocking Branch	Nelsonville to Athens	1836-1844	1895	14.00		
	Walhonding	Rochester to Roscoe	1836-1842	1896	19.00	607,269.00	19 miles abandoned and 6 miles in operation.
	Total				266.50	4,300,502.00	
Indiana	Wabash and Erie	Evansville, Ind., to Ohio State Line.	1832-1851		379.00	6,325,262.00	Wabash and Erie Canal never did any business of consequence.
	Whitewater	Lawrenceburg to Cambridge City.			74.00	1,400,000.00	Whitewater Canal was part of a great projected network of canals of more than 900 miles. Abandoned before completion on account of rapid growth of railroads.
	Total				453.00	7,725,262.00	
District of Columbia.	Washington Branch Canal	Potomac to Eastern Branch			1.21	25,978.00	
Virginia	James River and Kanawha	Richmond to Buchanan	1825-1851	1880	44.50	10,436,869.00	James River and Kanawha Canal sold to the Richmond and Allegheny R. R., the predecessor of Chesapeake and Ohio R. R. The canal now extends 9 miles out to the dam, and the Chesapeake and Ohio R. R. is required to maintain it as a conduit of water for power and water purposes for the city.
	Alexandria and Georgetown	Georgetown, D. C., to Alexandria, Va.	1830	1880-1890	7.12	1,250,000.00	Alexandria and Georgetown Canal designed as extension of Chesapeake and Ohio Canal when idea of towing canal boats by steam tugs was unknown. There is now a bridge across the Potomac on the piers of the old acqueduct. Canal boats are now towed from Chesapeake and Ohio Canal into Potomac River, which takes the place of the old Alexandria Canal.
	Total				51.62	11,686,869.00	

South Carolina	Wateree	Wateree to Black Creek, Roanoke River	1840	1841	14,000		Wateree Canal was a canal around the falls of Roanoke River above the towns of Weldon and Halifax
South Carolina	Santee	Santee River to Congaree Creek	1793 1845	1800	55,000	600,000	
	Wiggah	Wiggah Bay to Kinlock Creek	1840	1840	7,000		Wiggah Canal is now replaced by the Santee River canal and the Pinopolis Mosier Creek Canal
	Catawba	4 short canals around falls of Wateree River	1840	1840	11,000		
	Wateree	Colonel Mills to Ellington Mills	1840	1840	4,000		
	Saluda to Columbia	Broad River to Granby Ferry (Congaree River)	(a)	(b)	11,500		The various canals in Broad and Saluda Rivers were improvements of these streams near Columbia and were undertaken by the State of South Carolina
	Saluda	Around falls of Saluda River			1,000		
	Cuttaba	Around Cuttaba Falls Saluda River			5,000		
	Cuttaba	Around Cuttaba Shoals, Broad River	1818 1824	1818	5,000	100,000	
	Landstreet Canal	Branch canal from Catawba River			3,000		
	Rocky Creek Canal	Around falls in Saluda River					
	Total				11,000	700,000	
Georgia	Brunswick and Altamaha	Brunswick to Darien	1817 1845	1840	13,000	200,000	The Brunswick and Altamaha Canal never did any business. It was sold under the hammer and since the war no attempt has been made to revive it
	Ogeechee	Commodore to Rocky Comfort, via connecting Ogeechee and Savannah Rivers	1830 1840	(c)	10,000	100,000	
	Total				23,000	300,000	
Florida	Santa Fe Canal	Waldo to Alachua	1877 1880		10,000	20,000	
Louisiana	Bayou Canal (Chapeauroux Parish Canal)	Chapeauroux Parish to mouth below New Orleans, La		1880	1,000		This canal passes through one plantation and was built for the carrying of freight to and from this particular plantation. No towns are served
	Grand total				9,444,000	21,171,000	

a Before 1841.

b Later than 1840.

c Reported in 1883 as filled up.

7. STATE AND PRIVATE CANALS

CANALS IN NEW YORK

The State canal system of New York comprises:

1. The Erie Canal, connecting Lake Erie at Buffalo with the Hudson River at Albany.

	Miles.
Erie Canal	351.78
Navigable feeders	3.35
Total	355.13

The Erie Canal runs through the counties of Albany, Cayuga, Erie, Herkimer, Madison, Monroe, Montgomery, Niagara, Onondaga, Oneida, Orleans, Saratoga, Schenectady, and Wayne.

2. The Champlain Canal, connecting Lake Champlain with the Hudson River at West Troy.

	Miles.
Champlain Canal	66
Glens Falls feeder	12
Pond above Troy dam	3
Total	81

The Champlain Canal runs through the counties of Rensselaer, Saratoga, Warren, and Washington.

3. The Black River Canal, extending from the High Falls of Black River to the Erie Canal at Rome.

	Miles.
Black River Canal	35.33
Black River feeder	13.47
River improvement	42.50
Total	91.30

The Black River Canal runs through Oneida and Lewis counties.

4. The Oneida lake and canal feeder, near Rome, 6 miles.

5. The Oswego Canal, connecting the waters of Lake Ontario at Oswego with the Erie Canal at Syracuse.

	Miles.
Oswego Canal	38
Baldwinsville side cut	1
Oneida River improvement	20
Seneca River towing path	5
Total	64

The Oswego Canal runs through Onondaga and Oswego counties.

6. The Cayuga and Seneca Canal, 23 miles. Cayuga inlet, 2 miles.

The Cayuga and Seneca Canal runs through Cayuga, Seneca, and Ontario counties.

This system of 622.43 miles is owned by the State of New York, and by the constitution, Article VII, sections 8 and 10, it is provided that these canals shall forever remain the property of the State, and that they shall be improved as the legislature shall provide.

The canals of New York are divided into three divisions and a *number of* sections:

[illegible]

[illegible]

[illegible]

Enlarged canal—Size of canal: Width at surface 70 feet; width at bottom 52.5 feet; depth 7 feet. Lockage 86.58 feet. Locks, number, 11; length 110 feet; width 18 feet. Burden of boats, average, 210 tons capacity; maximum, 240 tons capacity. Date authorized, 1854; date completed, 1862. Cost, estimated at engineer's prices, $811,188; actual cost, $2,010,320.

Black River Canal.—Size of canal: Width at surface 42 feet; width at bottom 26 feet; depth 4 feet. Lockage 1,082.25 feet. Locks, number, 109; length 90 feet; width 15 feet. Two locks on Black River, length 160 feet; width 30 feet. Burden of boats, average, 70 tons capacity; maximum, 76 tons capacity. Construction of canal, date authorized, April 19, 1836; date begun, January, 1838; date completed, 1849. Cost of canal, estimated at engineer's prices, $1,068,437; actual cost, $3,581,954.

Oneida Lake Canal.—Size of canal: Width at surface 70 feet; width at bottom 47.25 feet; depth 7 feet. Lockage 60¼ feet. Locks, number, 7; length 110; width 18. Burden of boats, average, 220 tons capacity; maximum, 220 tons capacity. Construction of canal, date authorized, March 22, 1832; date completed, 1836. Cost of canal, estimated at engineer's prices, $40,000; actual cost, $450,678.

Oneida River Improvement.—Size of canal: Width at surface 80 feet; width at bottom 60 feet; depth 4½ feet. Lockage 6¼ feet. Locks, number, 2; length 120 feet; width 30 feet. Burden of boats, average, 70 tons capacity; maximum, 76 tons capacity. Construction of canal, date authorized, April 29, 1839; date completed, 1850. Cost, estimated at engineer's prices, $100,049; actual cost, $368,164.

Under act of April 7, 1903, by vote of the people of the State, the Erie, Oswego, and Champlain canals (which are really one waterway) are being enlarged to accommodate and to meet modern conditions. When these improvements are completed these canals will be navigated by canal boats (which will probably be propelled by steam) of a capacity of 1,500 tons and capable of carrying 50,000 bushels of wheat.

The course of the new barge canal takes it through 170 miles of earth and rock, 107 miles of canalized rivers, and 68 miles of open water. From Buffalo the canal will follow the present line of the Erie to Lyons, about 100 miles, with the exception of a new course taking it out of the city of Rochester. From near Lyons the new channel will lead through the Seneca and Oneida rivers to Oneida Lake, which is to be utilized. From the east end of Oneida Lake, Wood Creek enlarged will be made use of and with the new channel will connect with Mohawk River, which will be canalized to Waterford on the Hudson. Through the earth section the canal will be 75 feet wide at the bottom, 123 feet wide at the water line, and 133 feet at top of banks. In sections where the canal will be through rock it will be 94 feet wide at the bottom and 96 at top. The 38 locks in the entire course of the canal will be 328 feet long, 45 feet wide, and have 12 feet of water over their sills. Spurs of the barge canal will be built into the two largest interior cities—Rochester and Syracuse.

In addition to this main line, the Oswego River will be canalized from its junction with the Erie route to Lake Ontario, furnishing a waterway from that lake to the Hudson River with only 35 miles of canal. The Hudson River will also be made navigable from Troy to *Fort Edward* and from there a new canal will follow the line of the *Champlain Canal to* Lake Champlain.

[illegible]

[illegible]

[illegible]

passing around Niagara Falls. Provision was made for the improvement of navigable streams in Steuben County; the Peconeck River in Suffolk County; the Black River from Brownsville to Lake Ontario, and for a canal on the American side of the St. Lawrence River, but no permanent improvements seem to have been accomplished under these acts.

In April, 1811, a board of commissioners was created to investigate and report upon the subject of internal navigation. Commissioners were empowered to apply to the Congress of the United States or to the legislature of any State or Territory, to cooperate in opening a canal between the Great Lakes and the Hudson River, and in 1812 this board was authorized to make an agreement with the Western Inland Lock Navigation Company by which the State would secure a surrender of all the rights and interests of that company. The commissioners were empowered also to secure voluntary grants of land to the use of the State, and to borrow not to exceed $5,000,000 to be repaid within fifteen years, and to invest the sum so borrowed in such public stock or funds as to insure the best interests of the State in making the contemplated improvement. The creation of this board and the powers given it appear to be the first steps taken by the State in the construction of the Erie Canal. In 1814 the power of the commissioners to borrow money was revoked.

At this time the State was recovering from the effects of the war of 1812. It was a period of great activity and the desirability of water communication between the Hudson River and the Lakes forced itself upon the people of the State. One of the leading advocates of such a waterway was De Witt Clinton, afterwards the governor of the State. A memorial entitled "The New York Memorial," written by De Witt Clinton, was circulated and received the signatures of 100,000 petitioners. It called upon the authorities to proceed at once to construct a canal from the Hudson to Lake Erie, and its influence was such as to hasten the project. It has been said to mark the beginning of active progress on the canal. It superseded the idea of water communication by the Lake Ontario route. The movement met with powerful sectional and individual opposition, but its popularity with the masses of the people carried the day.

Another commission was authorized under the act of April 17, 1816, to consider and adopt measures necessary to effect water communication between the Hudson and Lake Erie and Lake Champlain. This commission was empowered to receive subscriptions or donations from the United States, other States or individuals, to estimate the cost of a canal, and to report to the general assembly.

Between 1813 and 1817 companies were incorporated to improve the navigation of Bronx Creek; to improve navigation between Seneca and Cayuga Lakes; to improve Catetunck Creek; to construct lock navigation between Seneca Lake and the Chemung River, and the officials of Steuben County were authorized to raise a specified amount ($400) each year for improving the navigability of the streams within that county. The time for the improvement of the St. Lawrence River at Madrid, N. Y., was extended to December 31, 1816. Several provisions were made for the improvement of the Hudson, and an extension of three years was given for the improvement of navigation on the Black River. In 1816 a company was authorized to provide boat navigation from Schenectady to Cohoes Falls and thence by a canal around the falls to the Hudson River,

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

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passed an act directing canal commissioners to make a considerable number of surveys and estimates for routes for navigable communication. At that time the future possibilities of the railroad could not have been anticipated and the canal was looked upon as the great highway for distance transportation. A company to construct the Oswego Canal was incorporated in 1823, the canal commissioners being given power to assume control of the same if necessary, as a part of the improvement between Lake Ontario and Lake Erie, and in 1825 they were authorized to borrow money for that purpose. In 1826 a canal board was created to consist of the canal commissioners and the commissioners of the canal fund. This board was given charge of the construction and regulation of the canals in which the State had any interest.

In 1827 by act of assembly the Erie and Champlain canals were declared to be completed and the navigable communications constructed and in process of construction by the State were designated and described. These were the Erie Canal, the Champlain Canal, the Cayuga and Seneca Canal, and the Oswego Canal. The canal fund was defined as consisting of (1) lands granted for the construction of canals; (2) debts due for portions of such lands as had been sold; (3) tolls and commutation money on navigable communications belonging to the State; (4) duty on the manufacture of salt under the act of April 15, 1817; (5) proceeds of all commodities or goods sold at auction except $33,500; (6) money received from the sale of surplus waters from any canal, and (7) money recovered in suits for penalties instituted under the canal laws.

Between 1828 and 1836 a number of private canal companies were incorporated by the State, and the canal commissioners were authorized to construct the Crooked Lake Canal, connecting Seneca and Crooked lakes; the Chemung Canal, which ran from the head of Seneca Lake to Elmira on the Chemung River, forming a chain of communication from the Erie Canal to the Susquehanna; the Chenango Canal running from Binghamton up the Chenango River to its headwaters and thence to the Erie Canal; and the Genessee Valley Canal, extending from Rochester through the Genessee Valley to the Allegheny River at Olean. The abandonment of these four latter canals, however, was authorized in 1878.

The volume of traffic passing through the Erie canal soon taxed its capacity, and in 1835 the commissioners proposed new locks and increased depth; and this enlargement was authorized, but was not finally completed until the year 1862. This enlargement increased the depth to 7 feet, the width at the bottom to 56 feet, and at the top to 70 feet.

The act of April 20, 1894, is an important one in canal legislation. It designated and defined the State canals, defined the powers and duties of the canal board, provided for a superintendent of public works and his assistants, giving him general care and superintendence of the canal with power to enforce the canal law; defined the powers and duties of the State engineer, and in general repealed nearly all the statutes relating to canals and the general canal legislation that had been passed from 1829 to 1893.

The decline in importance of the Erie Canal, owing to its physical inability to meet modern commercial requirements and the possibilities of its enlargement appealed to the assembly in 1895, when $9,000,000 was appropriated for the improvement of the Erie,

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balance sheet, for over and above the difference between income and the expenditures there are to the credit of the canals the indisputable benefits to the commerce and prosperity of the State.[a]

The canals are now maintained by taxation. The funds are handled by the commissioners of the canal fund, a board which consists of five members, the lieutenant-governor, the secretary of state, the comptroller, the state treasurer, and the attorney-general. This board supervises and manages the canal fund, makes recommendations and reports to the assembly, makes advances and superintends repairs and may borrow money when authorized.[b] The board of canal commissioners consists of the five officials mentioned above, including also the superintendent of public works and the state engineer and surveyor. This board is empowered to fix and change canal boundaries, to determine whether canal lands may be sold or abandoned, to investigate matters and transactions connected with canals, to examine and approve or disapprove all plans and estimates submitted to it by the State engineer, to order the sale of surplus waters of canals or creeks, and to grant permits for the erection of works for commercial or manufacturing purposes, and may investigate charges against certain officials.[c] The executive of the canals is the superintendent of public works, who has the general supervision of them, while the State engineer and surveyor prescribes surveys, plans, estimates, etc., in the construction or improvement of a canal.[d] The State tax levied for canal purposes in 1902 was thirteen one-hundredths mills. The total amount realized was $748,092.50.

Receipts and payments from the State treasurer on account of canals for the fiscal year ending December 30, 1902, were as follows:[e]

Receipts and taxes	$2,559,114.75
Interest on deposits	20,951.58
Interest on investments	70,135.59
Bonds sold and bought	92,309.92
Unexpended balances refunded	20,474.05
Miscellaneous	5,350.12
Total	2,768,336.01
Payments by warrant:	
Maintenance and ordinary repairs	960,448.96
Collecting statistics	21,676.93
Transfer, office agent, and expenses of loan	2,070.69
New work, extraordinary repairs, and damages	798,503.13
Interest on debt	255,000.00
Investments for sinking fund	225,392.58
Total	2,263,092.29

The canal sinking fund on September 30, 1902, consisted of the following:[f]

Securities	$2,009,513.82
Special deposits at three-twelfths per cent pending suitable investment	500,000.00
Money in the treasury	35,601.79
Total	2,545,115.61

[a] Report of Committee on Canals, New York, 1899, pp. 31, 151–153.
[b] Legislative Manual, 1903, p. 452.
[c] Laws of New York, 1894, chapter 338.
[d] Legislative Manual, 1903, p. 685
[e] Legislative Manual, 1903, p. 689.
[f] Legislative Manual, 1903, p. 710.

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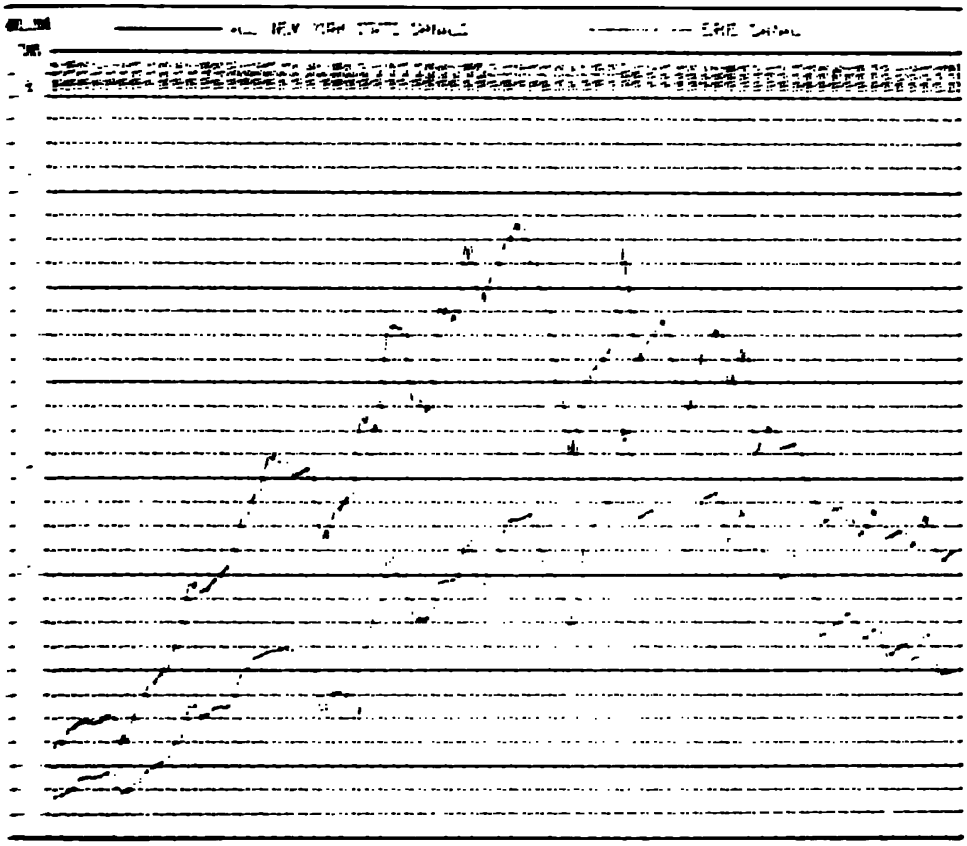

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eastbound cargo is about 240 net tons, while the return cargo is generally about 125 net tons.

Eastbound traffic consists almost wholly of grain, the westbound movement consists of miscellaneous freight. Fully 99 per cent of the boats are said to be owned by the captains running them and are not required to be registered, enrolled, or licensed. Practically the only work of the captain is to remain by his boat and move it along the canal. The captain pays for the motive power out of his charter price, but towing about the harbor for the purpose of loading and unloading is paid for by the transportation company or the forwarder. The forwarder contracts with the shipper to forward the freight at a certain rate and he charters the boat from the captain or owner. Out of the contract sum the forwarder pays the charter price, or if the shipment is destined for a point beyond Buffalo, the proportion accruing to the transportation company. He pays also the cost of loading and unloading, insuring of cargo, and other expenses. The difference, if any, represents the profit of the forwarder.

STATISTICS OF TRAFFIC ON NEW YORK CANALS

The following tables (and diagram 2) show the statistics of traffic on the New York canals and related commerce for varying periods:

TABLE 60—*Movement of articles on all New York State canals, 1837–1905*

[Annual report of the superintendent of public works of New York State, 1906]

Year.	Total.	Erie Canal.	Year.	Total.	Erie Canal.
	Tons.	*Tons.*		*Tons.*	*Tons.*
1837	1,171,296	667,151	1872	6,673,370	3,562,560
1838	1,333,011	744,848	1873	6,364,782	3,602,535
1839	1,435,713	845,007	1874	5,804,588	3,097,122
1840 [a]	1,416,046	829,960	1875	4,859,858	2,787,226
1841	1,521,661	906,442	1876	4,172,129	2,418,422
1842	1,236,931	712,310	1877	4,955,963	3,254,367
1843	1,513,439	819,216	1878	5,171,320	3,608,634
1844	1,816,586	945,944	1879	5,362,372	3,820,027
1845	1,977,565	1,038,700	1880	6,457,656	4,608,651
1846	2,268,662	1,264,408	1881	5,179,192	3,598,721
1847	2,869,810	1,661,575	1882	5,467,423	3,694,364
1848	2,796,230	1,599,965	1883	5,664,056	3,587,102
1849	2,894,732	1,622,444	1884	5,009,488	3,389,555
1850	3,076,617	1,635,089	1885	4,731,784	3,208,207
1851	3,582,733	1,955,265	1886	5,293,982	3,808,642
1852	3,863,441	2,129,334	1887	5,553,805	3,840,513
1853	4,247,853	2,198,308	1888	4,942,948	3,321,516
1854	4,165,862	2,224,008	1889	5,370,369	3,673,554
1855	4,022,617	2,202,463	1890	5,246,102	3,303,929
1856	4,116,082	2,107,678	1891	4,563,472	3,097,853
1857	3,344,061	1,566,624	1892	4,281,995	2,978,832
1858	3,665,192	1,767,004	1893	4,331,963	3,235,726
1859	3,781,684	1,753,954	1894	3,882,560	3,144,144
1860	4,650,214	2,253,533	1895	3,500,314	2,356,084
1861	4,507,635	2,500,782	1896	3,714,894	2,742,438
1862	5,598,785	3,204,277	1897	3,617,804	2,584,906
1863	5,557,692	2,955,302	1898	3,360,063	2,338,020
1864	4,852,941	2,535,702	1899	3,686,051	2,419,084
1865	4,729,654	2,523,490	1900	3,345,941	2,145,876
1866	5,775,220	2,896,027	1901	3,420,613	2,257,035
1867	5,688,325	2,920,578	1902	3,274,610	2,105,876
1868	6,442,225	3,346,986	1903	3,615,385	2,414,018
1869	5,859,080	2,845,072	1904	3,138,547	1,945,708
1870	6,173,769	3,083,132	1905	3,226,896	1,999,824
1871	6,467,888	3,580,922	1906	3,540,907	2,385,491

[a] Genesee Valley Canal opened.

TABLE 61—*Tonnage moved on each and all the canals, comprising the tons of total movement*—Continued

Year.	Erie.	Champlain.	Oswego.	Cayuga and Seneca.	Chemung.	Crooked Lake.	Chenango.	Genesee Valley.	Black River.	Oneida Lake.	Baldwinsville.	Total.
1880	4,608,651	1,200,503	427,863	125,331					75,308			6,457,656
1881	3,598,721	986,079	394,542	99,617					100,233			5,179,192
1882	3,694,364	1,097,343	445,295	123,488					106,933			5,467,423
1883	3,587,102	1,366,358	276,350	134,631					128,656			5,664,056
1884	3,389,555	1,118,073	260,541	119,990					116,359			5,009,488
1885	3,208,207	1,139,402	213,079	64,125					106,971			4,731,784
1886	3,808,642	1,119,663	186,484	64,995					114,198			5,293,982
1887	3,840,513	1,229,335	176,177	195,933					111,847			5,553,805
1888	3,321,516	1,198,305	134,078	201,237					118,213			4,942,948
1889	3,673,554	1,187,038	170,078	196,138					143,561			5,370,369
1890	3,303,929	1,520,757	225,936	63,419					132,061			5,246,102
1891	3,097,853	1,101,126	161,426	80,954					122,111			4,563,472
1892	2,978,832	1,021,139	90,886	75,669					115,469			4,281,995
1893	3,235,726	848,965	92,634	38,761					115,877			4,331,963
1894	3,144,144	550,279	98,843	33,270					56,024			3,882,560
1895	2,356,084	966,335	64,154	49,050					64,691			3,500,314
1896	2,742,438	802,519	57,245	54,739					57,953			3,714,894
1897	2,584,906	797,637	53,537	110,277					71,447			3,617,804
1898	2,338,020	804,076	47,662	100,342					69,963			3,360,063
1899	2,419,084	1,034,315	49,373	113,476					69,803			3,686,051
1900	2,145,876	972,867	31,742	130,126					65,330			3,345,941
1901	2,257,035	885,641	43,210	166,258					68,469			3,420,613
1902	2,105,876	766,615	143,707	155,152					103,260			3,274,610
1903	2,414,018	801,649	184,434	116,918					98,366			3,615,385
1904	1,945,708	796,468	170,342	140,656					85,373			3,138,547
1905	1,999,824	833,550	178,777	123,927					90,818			3,226,896
1906	2,385,491	740,983	172,228	164,874					77,331			3,540,907

TABLE 42.—Percentage burned in average 49 years of timbered and year for 49 years 1907–1955 burned in New York counties

Year.	Erie.	Champlain.	Oswego.	Cayuga and Seneca.	Black River.	Total.
1907	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1908	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1909	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1910	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1911	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1912	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1913	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1914	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1915	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1916	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1917	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1918	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1919	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1920	[illegible]	[illegible]	[illegible]	[illegible]		[illegible]
1921	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1922	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1923	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1924	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1925	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1926	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1927	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1928	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1929	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1930	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1931	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1932	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1933	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1934	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1935	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1936	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1937	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1938	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1939	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1940	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1941	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1942	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1943	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1944	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1945	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1946	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1947	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1948	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1949	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1950	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1951	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1952	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1953	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1954	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1955	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 65—*Commerce arriving at and going from tidewater, and internal movement of New York State*

[Report of auditor of canals, 1882, pp. 242-243, and reports of superintendent of public works]

Years.	Arriving at tidewater.					Going from tide-water.	Internal movement New York State.
	By Erie Canal.		By Champlain Canal.		Total.		
	From western States.	From New York.	Vermont and Canada.	New York.			
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
1836	54,219	364,906	53,853	223,369	696,347	133,796	480,668
1837	56,255	331,251	43,546	180,729	611,781	122,130	437,385
1838	83,233	336,016	36,330	184,902	640,481	142,808	549,722
1839	121,761	264,596	56,308	159,553	602,128	142,035	691,550
1840	158,148	309,167	50,900	150,797	669,012	129,580	617,454
1841	224,176	308,344	50,909	190,905	774,334	162,715	584,612
1842	221,477	258,672	30,515	155,962	666,676	123,294	447,011
1843	256,376	378,969	32,126	169,390	836,861	143,595	532,983
1844	308,025	491,791	33,974	185,304	1,019,094	176,737	620,755
1845	304,551	655,039	33,389	211,964	1,204,943	195,000	577,622
1846	506,830	600,440	41,852	213,196	1,362,319	213,815	692,528
1847	812,840	618,412	51,377	261,654	1,744,283	288,267	837,260
1848	650,154	534,183	34,528	229,040	1,447,905	329,557	1,018,768
1849	768,659	498,065	65,471	247,751	1,579,946	315,550	999,236
1850	841,501	530,358	124,033	355,155	2,033,863	418,370	624,384
1851	1,045,820	462,857	80,656	387,818	1,977,151	467,961	1,137,621
1852	1,151,978	492,726	107,941	482,182	2,334,828	521,527	1,107,087
1853	1,213,690	637,748	129,609	524,750	2,505,787	584,141	1,157,914
1854	1,094,391	602,167	108,848	412,202	2,223,743	531,831	1,410,288
1855	1,092,876	327,839	99,928	374,950	1,895,593	504,696	1,622,328
1856	1,212,550	374,580	91,254	445,085	2,123,469	573,733	1,418,880
1857	1,019,998	197,201	92,207	407,781	1,617,187	340,176	1,386,698
1858	1,273,099	223,588	93,069	395,386	1,985,142	287,073	1,392,977
1859	1,036,634	414,699	122,917	547,422	2,121,672	317,459	1,342,553
1860	1,896,975	379,086	104,150	474,666	2,854,877	373,735	1,421,602
1861	2,158,425	291,184	53,096	477,442	2,980,144	340,736	1,186,755
1862	2,594,837	322,257	72,601	413,014	3,402,709	417,623	1,778,453
1863	2,279,252	368,437	198,116	428,922	3,274,727	456,800	1,826,165
1864	1,907,136	239,498	195,532	466,091	2,805,257	493,913	1,553,771
1865	1,904,156	174,205	202,331	449,489	2,730,181	458,684	1,540,789
1866	2,235,716	287,948	220,890	561,053	3,305,607	626,974	1,842,639
1867	2,129,405	96,707	206,634	596,949	3,029,695	792,573	1,866,057
1868	2,215,222	163,350	193,474	668,760	3,240,806	1,067,020	2,134,399
1869	2,028,568	229,121	203,876	634,577	3,096,142	772,201	1,990,737
1870	2,048,947	241,751	244,617	620,987	3,156,302	940,429	2,077,038
1871	2,473,832	175,045	212,054	634,870	3,495,801	801,538	2,170,549
1872	2,456,022	214,383	261,058	716,481	3,647,944	926,228	2,099,198
1873	2,359,455	225,900	27,895	763,399	3,376,649	735,117	2,193,016
1874	2,200,364	269,933	193,823	559,292	3,223,112	753,981	1,827,495
1875	1,664,056	250,886	135,115	558,720	2,608,777	701,253	1,549,828
1876	1,402,768	342,552	128,223	552,639	2,426,182	745,797	1,000,150
1877	2,010,081	287,927	156,150	532,654	2,986,812	978,991	990,160

TABLE 66—*Total tonnage coming to the Hudson River from the Erie and Champlain canals, and aggregate value thereof, in market, 1838–1906*

[Report of the superintendent of public works, New York State, 1906]

Year.	Tons.	Value.	Year.	Tons.	Value.
1838	640,481	$23,038,510	1857	1,617,187	$51,190,018
1839	602,128	20,163,190	1858	1,985,142	61,536,061
1840	699,012	23,213,573	1859	2,121,672	43,175,312
1841	774,334	27,225,322	1860	2,854,877	78,798,617
1842	666,626	22,751,013	1861	2,980,144	81,432,759
1843	836,861	28,453,408	1862	3,402,709	111,176,568
1844	1,019,094	34,183,167	1863	3,274,727	123,173,294
1845	1,204,943	45,452,321	1864	2,805,257	145,609,202
1846	1,362,319	51,105,256	1865	2,730,181	113,865,846
1847	1,744,283	73,092,414	1866	3,305,607	131,801,477
1848	1,447,905	50,883,907	1867	3,029,695	120,902,834
1849	1,579,946	52,375,521	1868	3,240,806	136,446,582
1850	2,033,863	55,474,637	1869	3,096,142	144,866,060
1851	1,977,151	53,927,508	1870	3,156,302	105,517,020
1852	2,234,822	66,833,102	1871	3,494,801	106,874,570
1853	2,505,797	73,688,044	1872	3,647,944	107,086,362
1854	2,223,743	72,120,681	1873	3,376,649	97,869,497
1855	1,890,593	74,177,937	1874	3,123,112	107,976,476
1856	2,123,469	74,286,735	1875	2,608,777	89,447,518

TABLE 16—Tonnage [illegible] in the Russian [illegible] from the [illegible] and [illegible] [illegible] and upwards [illegible] [illegible] [illegible]—[illegible]

Year	Tons.	Tons.	Year	Tons.	Tons.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 17—Tonnage [illegible] in the [illegible] and [illegible] [illegible] [illegible] [illegible] [illegible]

[illegible] [illegible] [illegible] [illegible] [illegible] [illegible] [illegible]

Year	[illegible]	[illegible]	[illegible]	[illegible]
	Tons.	Tons.	Tons.	Tons.
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 68—*Losses or gains in tonnage of the New York Central Railway and Erie Railway and Canals (New York State), 1854–1906*

[Report superintendent of public works, New York State, 1906]

	New York Central [Railway].		Erie Railway.		Canals.		Total.	
	Gain.	Loss.	Gain.	Loss.	Gain.	Loss.	Gain.	Loss.
	Tons.	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*	*Tons.*
1854	189,804		112,211			81,991	220,024	
1855	120,269		19,798			143,245		3,178
1856	106,039		101,167		93,456		300,662	
1857	62,679		34,851			772,021		674,491
1858		73,284		161,112	321,131		86,735	
1859	68,912		53,119		116,492		238,523	
1860	193,864		270,481		868,530		1,332,875	
1861	139,119		113,864			142,579	110,404	
1862	220,131		379,537		1,091,150		1,690,818	
1863	62,171		182,141			41,093	203,219	
1864	107,544		355,702			704,751		241,505
1865		281,849	63,552			123,287		341,584
1866	326,898		1,008,442		1,045,566		2,380,906	
1867	65,729		241,754			86,895	220,588	
1868	178,673		423,697		753,900		1,356,270	
1869	435,286		403,966			583,145	256,107	
1870	1,840,115		540,296		314,689		2,695,100	
1871	410,056			8,297	294,119		695,878	
1872		138,091	720,066		205,482		787,457	
1873	1,128,759		748,430			308,588	1,568,601	
1874	591,954		51,574			560,194	83,334	
1875		112,724		124,330		944,730		1,181,784
1876	801,726			267,128		687,729		153,131
1877		452,324	209,633		783,834		541,143	
1878	1,344,057			31,833	215,357		1,527,581	
1879	1,320,340		2,062,073		191,052		3,573,465	
1880	1,517,285		503,251		1,095,284		3,115,820	
1881	1,058,341		2,370,931			1,278,464	2,150,808	
1882		260,986	808,415		228,231		775,660	
1883		437,953	1,715,385		196,633		1,474,065	
1884		680,022	2,608,975			654,568	1,274,385	
1885	521,081			818,449		277,704		575,072
1886	1,902,936		8,414,750		562,198		10,879,884	
1887	1,895,291			4,718,978	259,823			2,563,864
1888	631,086		1,224,749			610,857	1,244,978	
1889		151,271		89,877	427,421		186,273	
1890	1,096,900		1,185,524			124,267	2,158,157	
1891	513,126		1,069,884			682,530	900,480	
1892	4,100,176		995,576			281,477	4,814,275	
1893	590,220			1,025,518	49,968			385,330
1894		2,583,480		2,003,938		449,403		5,036,821
1895	1,012,903			2,376,730		382,246		1,746,073
1896	2,382,122		9,633,712		214,580		12,230,414	
1897		1,473,807		3,118,345		97,090		4,689,242
1898	2,753,629		3,103,631			257,741	5,599,519	
1899	1,953,035		112,707		325,988		2,391,730	
1900	12,230,022		1,840,868			340,110	13,730,780	
1901		183,374	316,008		74,672		207,306	
1902	5,149,464		1,431,463			146,003	6,434,924	
1903		4,471,206	4,338,168		340,775		207,737	
1904		1,701,725		1,594,450		476,838		3,773,013
1905	3,354,857		1,799,440		88,349		5,242,646	
1906	3,534,219		4,642,851		314,011		8,491,081	

TABLE 69—*Ton-mileage on New York canals and railroads*

[Report of committee on canals of New York State, 1899]

[In millions of ton-miles]

Year.	Canals[a] and river.	Railroads.	Total.[b]	Per cent canals.	Per cent railroads.
1853	1,075	171	1,246	86	14
1854	1,002	229	1,231	81	19
1855	904	264	1,168	77	23
1856	910	348	1,258	72	28
1857	726	332	1,058	69	31
1858	861	327	1,188	72	28
1859	862	334	1,196	72	28
1860	1,232	453	1,685	73	27

[a] Includes estimated ton-mileage of Canal Traffic on Hudson River; after 1880 the entire canal ton-mileage is estimated, as no records are kept.

[b] Minor discrepancies in totals corrected and percentages computed on basis of corrected figures.

TABLE 69—*Ton-mileage in [illegible] and railroads—[illegible]*

Year	Railroads and river	Railroads	Total	Per cent railroads	Per cent railroads
1861	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1862	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1863	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1864	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1865	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1866	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1867	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1868	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1869	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1870	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1871	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1872	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1873	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1874	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1875	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1876	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1877	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1878	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1879	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1880	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1881	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1882	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1883	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1884	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1885	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1886	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1888	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 70—*Tonnage and ton-miles—[illegible] and Eastern [illegible] and Eastern railroads*

(Complete non-[illegible] of [illegible] and [illegible] Annual Railroads)

Year	[illegible]		[illegible]		[illegible]	
	Tonnage	Ton-miles	Tonnage	Ton-miles	Tonnage	Ton-miles
1870	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1871	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1872	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1873	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1874	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1875	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1876	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1877	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1878	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1879	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1880	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1881	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1882	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1883	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1884	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1885	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1886	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1887	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1888	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1889	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1890	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1891	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1892	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1893	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1894	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1895	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1896	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1897	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1898	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
1899	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] the traffic in the [illegible] of tonnage in the [illegible] nomic in the [illegible].

The following tables show the extent of grain trade at Buffalo for a number of years:

TABLE 71—*Flour and grain received at Buffalo, by lake,*[a] *1836–1906*

[Annual reports of the superintendent of public works, New York]

Year.	Received at Buffalo—lake.			Year.	Received at Buffalo—lake.		
	Flour.	Grain.	Grain, including flour.		Flour.	Grain.	Grain, including flour.
	Barrels.	*Bushels.*	*Bushels.*		*Barrels.*	*Bushels.*	*Bushels.*
1836	139,178	543,461	1,239,351	1872	762,502	58,447,822	62,260,232
1837	126,805	550,560	1,184,685	1873	1,259,205	67,340,570	73,636,595
1838	277,620	974,751	2,302,887	1874	1,693,585	61,562,627	70,030,552
1839	294,125	1,117,262	2,302,851	1875	1,810,402	65,194,716	74,246,726
1840	597,142	1,075,885	4,061,598	1876	807,210	46,038,598	50,074,648
1841	730,040	1,852,325	5,692,525	1877	693,044	61,734,071	66,199,291
1842	734,408	2,015,928	5,687,468	1878	911,980	79,176,152	84,046,052
1843	917,517	2,055,025	6,642,610	1879	897,105	74,379,829	78,865,354
1844	915,030	2,335,568	6,910,719	1880	1,317,911	105,453,372	112,042,927
1845	746,759	1,848,040	5,581,790	1881	1,051,250	56,806,545	62,062,895
1846	1,374,529	6,491,522	13,366,167	1882	1,199,350	50,833,590	56,830,340
1847	1,857,000	8,688,187	19,153,187	1883	2,071,570	65,722,080	76,079,930
1848	1,249,000	7,396,012	14,641,018	1884	2,615,510	56,963,970	70,041,520
1849	1,207,435	8,628,013	14,665,189	1885	2,993,280	49,740,060	64,260,460
1850	1,103,039	6,618,004	12,059,551	1886	4,582,190	72,514,840	95,425,790
1851	1,258,224	11,449,661	17,740,784	1887	4,001,360	84,730,910	104,737,710
1852	1,299,213	13,392,937	20,390,500	1888	5,244,930	73,223,500	99,448,150
1853	975,557	11,078,741	15,956,525	1889	5,480,710	90,869,880	118,273,430
1854	739,756	18,553,455	22,252,288	1890	6,245,580	89,312,800	120,540,700
1855	937,761	10,788,473	24,472,277	1891	7,093,340	128,993,020	164,459,720
1856	1,126,048	20,123,667	25,753,965	1892	9,746,120	133,039,090	181,769,690
1857	845,953	15,348,930	19,578,690	1893	10,562,090	135,919,920	188,730,370
1858	1,536,109	20,202,444	26,812,982	1894	11,488,530	103,959,165	161,401 815
1859	1,420,383	14,429,069	21,530,722	1895	8,971,740	118,027,930	162,936,630
1860	1,122,335	31,441,440	37,073,115	1896	10,384,184	163,431,814	214,352,734
1861	2,159,591	50,062,646	61,460,601	1897	11,339,298	185,443,816	242,140,306
1862	2,846,022	58,642,344	72,872,454	1898	10,371,653	221,383,945	273,242,210
1863	2,978,088	49,845,065	64,735,510	1899	8,810,097	153,393,184	194,293,112
1864	2,028,520	41,044,498	51,177,146	1900	11,463,079	157,655,969	209,239,824
1865	1,788,393	42,473,223	51,415,188	1901	11,053,439	132,641,828	187,909,664
1866	1,313,543	51,829,342	57,388,087	1902	12,026,616	124,626,548	184,759,518
1867	1,440,056	43,499,780	59,700,060	1903	11,243,027	140,438,822	196,653,957
1868	1,502,731	42,436,201	49,949,856	1904	6,160,965	100,838,000	131,642,842
1869	1,598,487	37,014,728	45,007,163	1905	10,201,100	126,465,729	177,496,229
1870	1,470,391	39,261,141	46,013,096	1906	10,279,384	136,096,528	177,492,229
1871	1,278,077	60,765,357	67,155,742				

[a] Canadian railroad receipts included for several years prior to 1877.

TABLE 72—*Flour and grain received at Buffalo, by lake,*[a] *1846–1906*

Year.	Flour.	Wheat.	Corn.	Oats.	Barley.	Rye.
	Barrels.	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*	*Bushels.*
1846	1,374,529	4,744,184	1,455,258	218,300	47,530	28,250
1856	1,126,048	8,465,671	9,633,277	1,733,382	46,327	245,810
1866	1,313,543	10,479,694	27,894,798	10,227,472	1,606,384	1,245,485
1876	807,210	19,324,612	20,939,853	2,397,257	2,615,081	761,795
1877	693,044	23,284,405	33,362,866	4,279,229	1,652,568	1,055,003
1878	911,980	35,419,136	35,133,853	5,122,972	1,375,184	2,135,007
1879	897,105	37,788,501	32,990,993	1,104,794	600,740	1,884,802
1880	1,317,911	40,510,229	62,214,417	649,350	335,925	743,451
1881	1,051,250	18,495,320	34,434,830	4,565,737	282,510	22,210
1882	1,199,350	26,050,030	21,664,530	1,650,170	701,500	767,360
1883	2,071,570	24,105,420	34,975,040	3,226,900	583,890	2,830,830
1884	2,615,510	32,469,710	18,538,340	3,174,730	534,130	2,247,060
1885	2,993,280	27,130,400	21,028,230	767,580	577,230	309,370
1886	4,582,190	41,430,440	29,155,370	1,014,670	787,730	126,630
1887	4,001,360	48,.....180	30,189,490	4,656,280	1,459,420	304,540
1888	5,244,930	27,548,110	36,422,270	7,897,310	842,090	513,720
1889	5,480,710	26,051,600	47,127,150	14,309,800	1,474,579	1,906,760
1890	6,245,580	24,868,630	44,136,060	13,860,780	5,165,700	1,281,630
1891	7,093,340	76,945,960	29,616,390	12,454,150	4,273,120	5,603,400
1892	9,746,120	78,343,560	32,377,780	16,500,250	4,600,970	1,316,530
1893	10,562,090	68,243,750	40,539,970	20,700,150	5,791,460	644,560
1894	11,488,530	50,194,130	29,078,520	15,560,230	8,625,090	501,195
1895	10,005,258	47,437,280	37,056,339	22,056,339	10,461,790	935,855
1896	10,384,184	54,41 ,207	47,811,010	40,107,499	16,607,744	4,404,354

[a] *Flaxseed not included.* Canadian railroad receipts included for several years prior to 1877.

TABLE [illegible]—[illegible]

Year	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]

The following statement shows the receipts of grain and flaxseed at Buffalo, the average canal freight on wheat, and the tolls on wheat to New York, and the elevating and storage rates at Buffalo, for a series of years:

TABLE 74—*Freight, tolls, elevating and storage rates, 1870–1906*

[Annual report Buffalo Chamber of Commerce, 1906]

Year.	Grain received.	Average canal freight on wheat, per bushel.	Tolls on wheat, per bushel.[a]	Elevating, including storage, per bushel.[a]
	Bushels.	*Cents.*	*Cents.*	*Cents.*
1870	32,208,039	11.2	3.1	1⅝
1871	61,319,313	12.6	3.1	1⅝
1872	58,703,666	13.0	3.1	1⅝
1873	65,498,955	11.4	3.1	1⅝
1874	55,660,198	10.0	3.1	1⅝
1875	52,833,451	7.9	2.0	1
1876	44,207,121	6.6	2.0	1
1877	61,822,292	7.4	1.0	1
1878	78,828,443	6.0	1.0	1
1879	75,089,768	6.8	1.0	1
1880	105,133,009	6.5	1.0	1
1881	56,389,827	4.7	1.0	
1882	51,501,503	5.4	1.0	
1883	65,722,080	4.9	None.	
1884	[b]58,011,800	4.2	None.	
1885	52,671,090	3.8	None.	
1886	75,570,850	5.0	None.	
1887	87,073,570	4.6	None.	
1888	73,977,390	3.4	None.	
1889	92,290,550	4.8	None.	
1890	91,994,680	3.8	None.	
1891	135,315,510	3.5	None.	
1892	138,872,560	3.5	None.	
1893	140,796,410	4.6	None.	
1894	105,435,577	3.2	None.	
1895	121,225,497	2.2	None.	
1896	172,474,664	3.7	None.	
1897	204,964,103	2.8	None.	
1898	221,383,945	2.8	None.	[c]
1899	153,393,184	3.0	None.	
1900	157,655,969	2.5	None.	
1901	132,646,828	3.5	None.	
1902	124,626,438	3.8	None.	
1903	140,438,822	4.0	None.	
1904	100,838,000	3.2	None.	
1905	126,465,729	3.9	None.	
1906	136,096,528	4.2	None.	

[a] Prior to 1870, tolls 6.21 cents a bushel and the elevating charge 2 cents.
[b] The years 1884 to 1905, both inclusive, include flaxseed.
[c] Five-eighths of a cent to nothing.

TABLE [illegible]—*Wheat and flour traffic on the Erie Canal, [illegible]–[illegible]*

(Annual summaries of Commerce and Finance, [illegible] to [illegible])

Year.	From Western States.	From New York State.	Arriving at tide water.	Year.	From Western States.	From New York State.	Arriving at tide water.
	Bushels.	*Bushels.*	*Bushels.*		*Bushels.*	*Bushels.*	*Bushels.*
185[illegible]	2[illegible],229	[illegible],[illegible]1	[illegible],[illegible]	185[illegible]	1,210,020		[illegible],[illegible]02
185[illegible]	[illegible]17,[illegible]8	[illegible],[illegible]79	[illegible],[illegible]	186[illegible]	[illegible],[illegible]4,[illegible]87	[illegible],[illegible]22	[illegible],[illegible]81,[illegible]8[illegible]
185[illegible]	2[illegible]4,[illegible]82	[illegible],[illegible]75	[illegible],[illegible]	186[illegible]	[illegible],[illegible]	[illegible]46,[illegible]	[illegible],[illegible]67,[illegible]
185[illegible]	[illegible]52,[illegible]85	[illegible]57,[illegible]06	[illegible],[illegible]10	186[illegible]	[illegible],[illegible]10,[illegible]97	[illegible]42,[illegible]85	[illegible],[illegible]80,[illegible]92
185[illegible]	[illegible]63,[illegible]70	[illegible]25,[illegible]44	[illegible],[illegible]10,[illegible]55	186[illegible]	[illegible],[illegible]	[illegible]96,[illegible]19	[illegible],[illegible]70,[illegible]32
1840	[illegible],[illegible]46,[illegible]15	[illegible],[illegible]80,[illegible]84	[illegible],[illegible]46,[illegible]24	1864	[illegible],[illegible]85,[illegible]46	[illegible]87,[illegible]	[illegible],[illegible]42,[illegible]44
1841	[illegible],[illegible]22,[illegible]47	[illegible]86,[illegible]57	[illegible],[illegible]29,[illegible]44	1865	[illegible],[illegible]71,[illegible]64	[illegible]29,[illegible]82	[illegible],[illegible]81,[illegible]58
1842	[illegible],[illegible]46,[illegible]21	[illegible]46,[illegible]84	[illegible],[illegible]76,[illegible]15	1866	[illegible],[illegible]82,[illegible]73	[illegible],[illegible]54	[illegible],[illegible]07,[illegible]37
1843	[illegible],[illegible]58,[illegible]46	[illegible]70,[illegible]22	[illegible],[illegible]37,[illegible]17	1867	[illegible],[illegible]28,[illegible]07	[illegible]27,[illegible]16	[illegible],[illegible]42,[illegible]70
1844	[illegible],[illegible]77,[illegible]74	[illegible]46,[illegible]09	[illegible],[illegible]54,[illegible]65	1868	[illegible],[illegible]41,[illegible]85	.....	[illegible],[illegible]71,[illegible]24
1845	[illegible],[illegible]22,[illegible]40	[illegible],[illegible]28,[illegible]41	[illegible],[illegible]42,[illegible]26	1869	[illegible],[illegible]20,[illegible]19	[illegible]45,[illegible]78	[illegible],[illegible]20,[illegible]97
1846	[illegible],[illegible]72,[illegible]74	[illegible]29,[illegible]20	[illegible],[illegible]52,[illegible]04	1870	[illegible],[illegible]17,[illegible]78	.....	[illegible],[illegible]04,[illegible]54
1847	[illegible],[illegible]09,[illegible]22	[illegible]71,[illegible]18	[illegible],[illegible]70,[illegible]28	1871	[illegible],[illegible]28,[illegible]20	[illegible]89,[illegible]77	[illegible],[illegible]37,[illegible]07
1848	[illegible],[illegible]65,[illegible]48	[illegible]70,[illegible]1[illegible]	[illegible],[illegible]72,[illegible]92	1872	[illegible],[illegible]30,[illegible]16	.....	[illegible],[illegible]20,[illegible]14
1849	[illegible],[illegible]62,[illegible]21	[illegible]86,[illegible]59	[illegible],[illegible]79,[illegible]79	1873	[illegible],[illegible]06,[illegible]42	.....	[illegible],[illegible]30,[illegible]17
1850	[illegible],[illegible]04,[illegible]59	[illegible]93,[illegible]71	[illegible],[illegible]80,[illegible]26	1874	[illegible],[illegible]04,[illegible]32	.....	[illegible],[illegible]24,[illegible]20[illegible]
1851	[illegible],[illegible]46,[illegible]74	[illegible]93,[illegible]47	[illegible],[illegible]01,[illegible]07	1875	[illegible],[illegible]52,[illegible]20	.....	[illegible],[illegible]08,[illegible]55
1852	[illegible],[illegible]57,[illegible]26	[illegible]77,[illegible]31	[illegible],[illegible]12,[illegible]01	1876	[illegible],[illegible]61,[illegible]73	.....	[illegible],[illegible]94,[illegible]70
1853	[illegible],[illegible]92,[illegible]29	[illegible]57,[illegible]84	[illegible],[illegible]60,[illegible]23	1877	[illegible],[illegible]47,[illegible]18	.....	[illegible],[illegible]72,[illegible]85
1854	[illegible],[illegible]56,[illegible]91	[illegible]87,[illegible]52	[illegible],[illegible]46,[illegible]12	1878	[illegible],[illegible]29,[illegible]46	[illegible]40,[illegible]73	[illegible],[illegible]18,[illegible]94
1855	[illegible],[illegible]18,[illegible]70[illegible]		[illegible],[illegible]99,[illegible]28	1879	[illegible],[illegible]42,[illegible]73	[illegible]92,[illegible]80	[illegible],[illegible]04,[illegible]09
1856	[illegible],[illegible]20,[illegible]21	[illegible]70,[illegible]34	[illegible],[illegible]46,[illegible]77	1880	[illegible],[illegible]16,[illegible]28	[illegible]42,[illegible]46	[illegible],[illegible]33,[illegible]74
1857	[illegible],[illegible]12,[illegible]22		[illegible],[illegible]98,[illegible]26	1881	[illegible],[illegible]94,[illegible]01	[illegible]07,[illegible]22	[illegible],[illegible]01,[illegible]10
1858	[illegible],[illegible]78,[illegible]09		[illegible],[illegible]76,[illegible]91				

[1] In terms of flour, 5 bushels of wheat being considered equivalent to 1 barrel of flour.

[2] As result is partly estimated. In several years a quantity of wheat taken to reach tide water, owing to the earlier closing of navigation.

Since 1881 the shipments from New York State have become a totally negligible factor.

TABLE [illegible]—*Total movement of flour, meal and grain in all the New York State canals, 1837–1898*

(Annual reports of the superintendent of public works, New York State, 1898)

Year.	Total all grains.	Year.	Total all grains.
	Tons.		*Tons.*
1837	[illegible],[illegible]70,251	1844	[illegible],[illegible]08,[illegible]48
1838	[illegible],[illegible]52,[illegible]29	1845	[illegible],[illegible]29,[illegible]20
1839	[illegible],[illegible]21,[illegible]45	1846	[illegible],[illegible]46,[illegible]77[illegible]
1840	[illegible],[illegible]47,[illegible]50	1847	[illegible],[illegible]49,[illegible]94
1841	[illegible],[illegible]50,[illegible]57	1848	[illegible],[illegible]16,[illegible]7[illegible]
1842	[illegible],[illegible]01,[illegible]16	1849	[illegible],[illegible]77,[illegible]14
1843	[illegible],[illegible]22,[illegible]74	1850	[illegible],[illegible]78,[illegible]09
1844	[illegible],[illegible]21,[illegible]09	1851	[illegible],[illegible]72,[illegible]77[illegible]
1845	[illegible],[illegible]21,[illegible]97	1852	[illegible],[illegible]02,[illegible]70
1846	[illegible],[illegible]90,[illegible]57	1853	[illegible],[illegible]65,[illegible]40
1847	[illegible],[illegible]79,[illegible]92	1854	[illegible],[illegible]24,[illegible]59
1848	[illegible],[illegible]20,[illegible]49	1855	[illegible],[illegible]46,[illegible]74
1849	[illegible],[illegible]41,[illegible]91	1856	[illegible],[illegible]04,[illegible]072
1850	[illegible],[illegible]70,[illegible]40	1857	[illegible],[illegible]71,[illegible]21[illegible]
1851	[illegible],[illegible]20,[illegible]1[illegible]	1858	[illegible],[illegible]58,[illegible]74
1852	[illegible],[illegible]91,[illegible]97	1859	[illegible],[illegible]92,[illegible]40
1853	[illegible],[illegible]59,[illegible]95	1860	[illegible],[illegible]47,[illegible]70[illegible]
1854	[illegible],[illegible]44,[illegible]42	1861	[illegible],[illegible]65,[illegible]62[illegible]
1855	[illegible],[illegible]71,[illegible]46	1862	[illegible],[illegible]57,[illegible]65
1856	[illegible],[illegible]01,[illegible]210	1863	[illegible],[illegible]46,[illegible]93
1857	[illegible],[illegible]07,[illegible]46	1864	[illegible],[illegible]36,[illegible]01
1858	[illegible],[illegible]97,[illegible]55	1865	[illegible],[illegible]41,[illegible]17
1859	[illegible],[illegible]29,[illegible]90	1866	[illegible],[illegible]81,[illegible]07

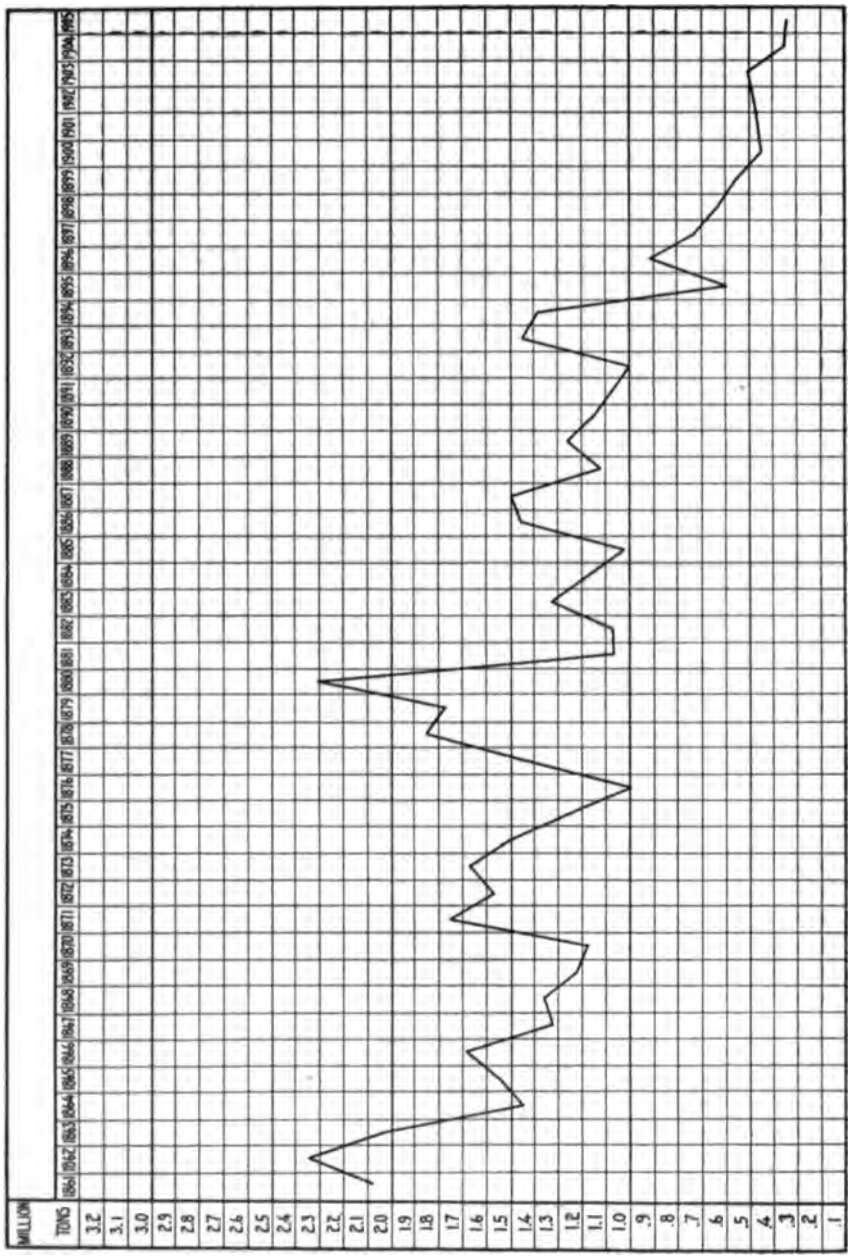

DIAGRAM 3—Total movements of flour, meal, and grain on New York canals, 1861–1905 (Table 76)

TABLE 7.—Total and water movement of grain at New York, 1885–1910

[Report of the Committee on Canals, New York State, 1900]

Year	Receipts by canal	Receipts by railroad	Total receipts	Receipts by canal	Receipts by railroad	Exports
	Bushels.	*Bushels.*	*Bushels.*	*Per cent.*	*Per cent.*	*Bushels.*
1885	4,07[illegible],259	.....	4,7[illegible],469	8[illegible]	.....	5,2[illegible],131
1886	3,49[illegible],269	.....	4,7[illegible],729	7[illegible].4	.....	3,4[illegible],115
1887	3,724,488	.....	4,4[illegible],41	7[illegible].4	.....	3,4[illegible],065
1888	5,4[illegible],210	.....	7[illegible],447,259	7[illegible].3	.....	3,1[illegible],[illegible]
1889	5,12[illegible],946	.....	7,0[illegible],915	7[illegible].4	.....	3,4[illegible],172
1890	4,3[illegible],445	.....	7,7[illegible],172	6[illegible].4	.....	4,1[illegible],[illegible]
1891	5,0[illegible],[illegible]	.....	8,3[illegible],[illegible]	8[illegible]	.....	3,0[illegible],[illegible]
1892	3,[illegible],[illegible]	.....	7,2[illegible],316	5[illegible].2	.....	4,0[illegible],704
1893	3,367,274	4,0[illegible],259	7,0[illegible],777	4[illegible].4	3[illegible].2	4,7[illegible],724
1894	4,491,7[illegible]	3,0[illegible],[illegible]	8,[illegible],[illegible]	5[illegible].4	4[illegible].7	3,0[illegible],394
1895	6,0[illegible],[illegible]	6,[illegible],4[illegible]	12,6[illegible],[illegible]	4[illegible]	4[illegible].7	6,[illegible],[illegible]
1896	5,035,307	7,4[illegible],04[illegible]	12,[illegible],[illegible]	4[illegible].4	3[illegible].2	10,[illegible],[illegible]
1897	6,344,859	7,[illegible],[illegible]	14,[illegible],[illegible]	4[illegible].2	3[illegible].4	11,[illegible],[illegible]
1898	3,1[illegible],910	7,2[illegible],07	11,[illegible],[illegible]	3[illegible].4	6[illegible].4	7,1[illegible],[illegible]
1899	3,[illegible],344	3,0[illegible],[illegible]	5,[illegible],[illegible]	3[illegible].4	6[illegible].4	4,[illegible],711
1900	4,2[illegible],[illegible]	3,[illegible],[illegible]	8,[illegible],[illegible]	4[illegible].2	3[illegible].4	3,[illegible],[illegible]
1901	3,9[illegible],[illegible]	4,[illegible],97[illegible]	8,[illegible],4[illegible]	4[illegible]	5[illegible].4	4,2[illegible],[illegible]
1902	3,[illegible],67[illegible]	6,[illegible],0[illegible]	9,4[illegible],5[illegible]	3[illegible]	6[illegible].4	3,7[illegible],[illegible]
1903	4,[illegible],[illegible]	3,[illegible],[illegible]	14,[illegible],[illegible]	4[illegible]	3[illegible]	5,[illegible],[illegible]
1904	4,[illegible],[illegible]	3,7[illegible],[illegible]	9,[illegible],[illegible]	4[illegible].2	3[illegible]	3,0[illegible],0[illegible]
1905	4,0[illegible],00	4,3[illegible],[illegible]	7,[illegible],0[illegible]	4[illegible]	5[illegible]	2,[illegible],[illegible]
1906	3,9[illegible],[illegible]	3,4[illegible],74[illegible]	6,6[illegible],53	4[illegible].4	5[illegible].4	4,4[illegible],4[illegible]
1907	3,[illegible],40	6,[illegible],[illegible]	9,[illegible],[illegible]	3[illegible].4	6[illegible].2	4,4[illegible],0[illegible]
1908	3,[illegible],04	9,[illegible],77	12,[illegible],0[illegible]	2[illegible].4	7[illegible].4	6,[illegible],7[illegible]
1909	3,7[illegible],07	10,11[illegible],07[illegible]	13,[illegible],3[illegible]	1[illegible].7	7[illegible]	7,[illegible],[illegible]
1910	4,[illegible],[illegible]	4,[illegible],[illegible]	10,[illegible],4[illegible]	4[illegible].4	5[illegible].4	5,[illegible],[illegible]
1911	4,03[illegible],[illegible]	4,[illegible],[illegible]	8,[illegible],[illegible]	4[illegible]	4[illegible]	3,[illegible],47
1912	4,[illegible],10	7,[illegible],[illegible]	8,[illegible],[illegible]	1[illegible]	6[illegible].4	4,7[illegible],[illegible]
1913	2,[illegible],[illegible]	9,[illegible],[illegible]	12,[illegible],[illegible]	2[illegible].7	7[illegible]	0,[illegible],[illegible]
1914	2,[illegible],[illegible]	12,[illegible],[illegible]	15,[illegible],[illegible]	1[illegible]	8[illegible].4	17,[illegible],[illegible]
1915	1,407,10[illegible]	14,[illegible],[illegible]	16,1[illegible],[illegible]	2[illegible]	8[illegible].4	12,[illegible],[illegible]
1916	1,7[illegible],[illegible]	7,[illegible],[illegible]	8,[illegible],[illegible]	1[illegible]	8[illegible]	[illegible]

TABLE 8.—Receipts of lumber, lath, and shingles by canal, and shipments of lumber by canal at the Tonawandas, 1894–1916

[From annual report of Chamber of Commerce, Buffalo, 1916]

Year	Receipts: Lumber	Receipts: Lath	Receipts: Shingles	Shipments of lumber
	Feet.	*Pieces.*	*Pieces.*	*Feet.*
1894	40,[illegible],[illegible],500	7,[illegible],350	3,[illegible],[illegible]	15,[illegible],[illegible],32[illegible]
1895	54,[illegible],[illegible],500	7,[illegible],500	4,[illegible],[illegible]	21[illegible],[illegible],70[illegible]
1896	40,[illegible],[illegible],400	2,[illegible],500	7,0[illegible],[illegible]	14,[illegible],[illegible],74[illegible]
1897	40,[illegible],[illegible],[illegible]	[illegible],[illegible],350	[illegible],[illegible],[illegible]	17,[illegible],[illegible],[illegible]
1898	38,[illegible],[illegible],[illegible]	[illegible],[illegible],400	5,[illegible],000	15,[illegible],[illegible],[illegible]
1899	43,[illegible],[illegible],400	3,[illegible],035	1,[illegible],[illegible]	20,[illegible],[illegible],64[illegible]
1900	40,[illegible],[illegible],000	[illegible],[illegible],500	[illegible],[illegible],000	16,[illegible],[illegible],[illegible]
1901	47,[illegible],[illegible],300	2,[illegible],250	[illegible],[illegible],250	17,[illegible],[illegible],15[illegible]
1902	40,[illegible],[illegible],41	[illegible],[illegible],400	2,[illegible],000	13,[illegible],[illegible],63[illegible]
1903	40,[illegible],[illegible],[illegible]	2,[illegible],350	.....	17,[illegible],[illegible],20[illegible]
1904	41,[illegible],[illegible],270	[illegible],[illegible],600	2,700,000	14,[illegible],[illegible],4[illegible]

TABLE 79—*Average railroad and canal freight rates per ton-mile*[a]

[Corrected specie values]

Year.	Erie R. R.	New York Central and Hudson River R. R.	Lake Shore and Michigan Southern Rwy.	Michigan Central R. R.	Pennsylvania R. R.	Pittsburgh, Fort Wayne and Chicago Rwy.	Chesapeake and Ohio Rwy.	New York canals.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1865	1.564	1.955	1.645	1.735	1.538	1.385	.....	0.65
1866	1.712	2.181	1.746	1.834	1.636	1.423	4.661	.71
1867	1.465	1.980	1.745	1.787	1.497	1.403	3.753	.65
1868	1.287	1.951	1.661	1.743	1.322	1.211	3.179	.62
1869	1.137	1.763	1.266	1.544	1.229	1.198	3.752	.68
1870	1.125	1.590	1.269	1.673	1.268	1.229	4.101	.73
1871	1.282	1.457	1.244	.972	1.211	1.276	4.445	.92
1872	1.362	1.422	1.227	1.392	1.304	1.264	3.643	.91
1873	1.268	1.371	1.164	1.365	1.258	1.220	1.909	.78
1874	1.184	1.319	1.065	1.728	1.164	1.134	1.354	.67
1875	1.061	1.119	.887	1.018	.989	.970	1.299	.58
1876	.972	.929	.722	.986	.841	.827	1.061	.61
1877	.898	.954	.813	.924	.954	1.024	1.035	.54
1878	.960	.919	.724	.836	.914	.867	.985	.42
1879	.779	.793	.641	.691	.823	.754	.860	.46
1880	.836	.879	.750	.842	.918	.....	.866	.41
1881	.805	.783	.617	.718	.857	.745	.892	.42
1882	.749	.738	.628	.772	.874	.752	.753	.40
1883	.786	.915	.728	.830	.881	.787	.723	.33
1884	.719	.834	.652	.646	.804	.673	.672	.27
1885	.656	.688	.553	.560	.695	.577	.550	.26
1886	.659	.765	.639	.686	.755	.692	.541	.34
1887	.687	.782	.670	.694	.730	.717	.537	.29
1888	.716	.753	.673	.702	.723	.66	.541	.22
1889	.644	.712	.632	.702	.685	.69	.538	.29
1890	.643	.730	.644	.701	.661	.69	.561	.26
1891	.636	.740	.630	.723	.656	.70	.525	.24
1892	.614	.699	.602	.687	.647	.67	.518	.23
1893	.631	.701	.599	.691	.620	.68	.511	.31
1894	.609	.733	587	.671	.606	.65	.478	.21
1895	.604	.726	.567	.662	.565	.64	.425	.15
1896	.606	.668	.551	.626	.563	.66	.425	.25
1897	.609	.679	.538	.615	.561	.60	.419	.19
1898	.56	.61	.502	.597	.....	.57	.37	.19
1899	.52	.59	.....	.....	.....	.....	.36	.19
1900	.56	.56	.51	.59	.54	.58	.34	.17
1901	.....	.....	.....	.....	.....	.....	.....	.23
1902	.64	.63	.52	.68	.59	.61	.40	.25
1903	.61	.64	.52	.66	.61	.62	.47	.27
1904	.63	.66	.52	.65	.61	.60	.47	.21
1905	.62	.61	.52	.61	.59	.61	.43	.26
1906	.60	.64	.52	.63	.59	.61	.42	.28

[a] Railroads from "Changes in the Rates of Charges for Railway and other Transportation Services," U. S. Dept. Agriculture, 1898, pp. 19, 20. Statistical Abstract of the United States, 1907, p. 226.
Canals from reports of auditor of canal department and superintendent of public works, corrected for gold premium from 1865 to 1879. From 1883 to 1899 canal rates are based on rates on wheat from Buffalo to New York.

TABLE 40—*Average lake and canal rates on wheat and corn since 1850*

[Report of the superintendent of public works of New York State, 1906]

Year.	Wheat, per bushel.			Corn, per bushel.		
	Freight, Buffalo to New York.	Tolls.	Lake freight.	Freight, Buffalo to New York.	Tolls.	Lake freight.
	Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1850	1.6	Free.	1.0	1.3	Free.	1.0
1851	1.3	Free.	.....	1.3	Free.	.....
1852	1.4	Free.	1.1	1.5	Free.	1.3
1853	1.6	.....	1.6	1.3	.....	1.5
1854	1.2	.....	1.4	1.6	.....	1.5
1855	1.9	.....	1.0	1.0	.....	1.0
1856	1.0	.....	1.0	1.0	.....	1.3
1857	1.4	.....	1.3	1.3	.....	1.2
1858	1.6	.....	1.0	1.3	.....	1.3
1859	1.2	.....	1.0	1.0	.....	1.0
1860	1.3	.....	1.2	1.2	.....	1.6
1861	1.4	.....	1.7	1.1	.....	1.4
1862	1.7	.....	1.6	1.4	.....	1.3
1863	1.6	.....	1.9	1.3	.....	1.1
1864	1.4	.....	1.0	1.7	.....	1.4
1865	1.6	.....	1.4	1.4	.....	1.0
1866	1.4	.....	1.7	1.0	.....	1.4
1867	1.0	.....	.....	.....	.....	.....

TABLE 41—*Average cream rates on corn from Chicago to New York, 1869–1904*

[Compiled from Bulletin 5 of Division of Statistics, United States Department of Agriculture; annual Statistical Report of New York Produce Exchange, 1903, and annual Report of Chicago Board of Trade, 1904]

[In cents per bushel]

Year.	As reported in the Chicago Board of Trade.		From New York Produce Exchange.	Year.	As reported in the Chicago Board of Trade.		From New York Produce Exchange.
	Water rail.	Water and rail.	Water, canal, and rivers.[a]		Water rail.	Water and rail.	Water, canal, and rivers.[a]
1869	4.0	7.7	4.0	1888	2.4	0.3	2.4
1870	2.7	9.3	2.7	1889	2.0	4.9	2.9
1871	3.7	7.4	4.3	1890	1.8	7.2	2.0
1872	3.0	3.7	2.0	1891	2.0	7.3	2.3
1873	3.2	10.9	2.9	1892	2.4	7.2	2.0
1874	2.3	2.6	1.9	1893	2.5	7.7	2.7
1875	2.0	1.4	1.0	1894	2.2	1.0	2.0
1876	4.2	4.0	7.0	1895	0.9	4.0	2.7
1877	5.0	5.2	4.1	1896	0.0	1.5	2.4
1878	6.9	0.4	4.7	1897	1.3	4.0	2.9
1879	4.8	2.9	0.3	1898	4.0	2.1	2.6
1880	7.4	4.4	1.4	1899	0.0	2.6	2.0
1881	2.0	4.2	7.3	1900	4.9	4.4	2.0
1882	2.0	0.3	7.2	1901	4.1	2.6	2.4
1883	2.2	1.0	7.6	1902	4.4	2.3	2.8
1884	2.2	4.0	2.4	1903	0.4	2.7	2.0
1885	2.2	4.1	2.3	1904	0.3	2.2	2.0
1886	4.0	1.0	7.0	1905	4.0	2.9	2.1
1887	4.7	1.0	7.8	1906	4.2	2.2	.....

[a] Exclusive of handling charges at Buffalo.

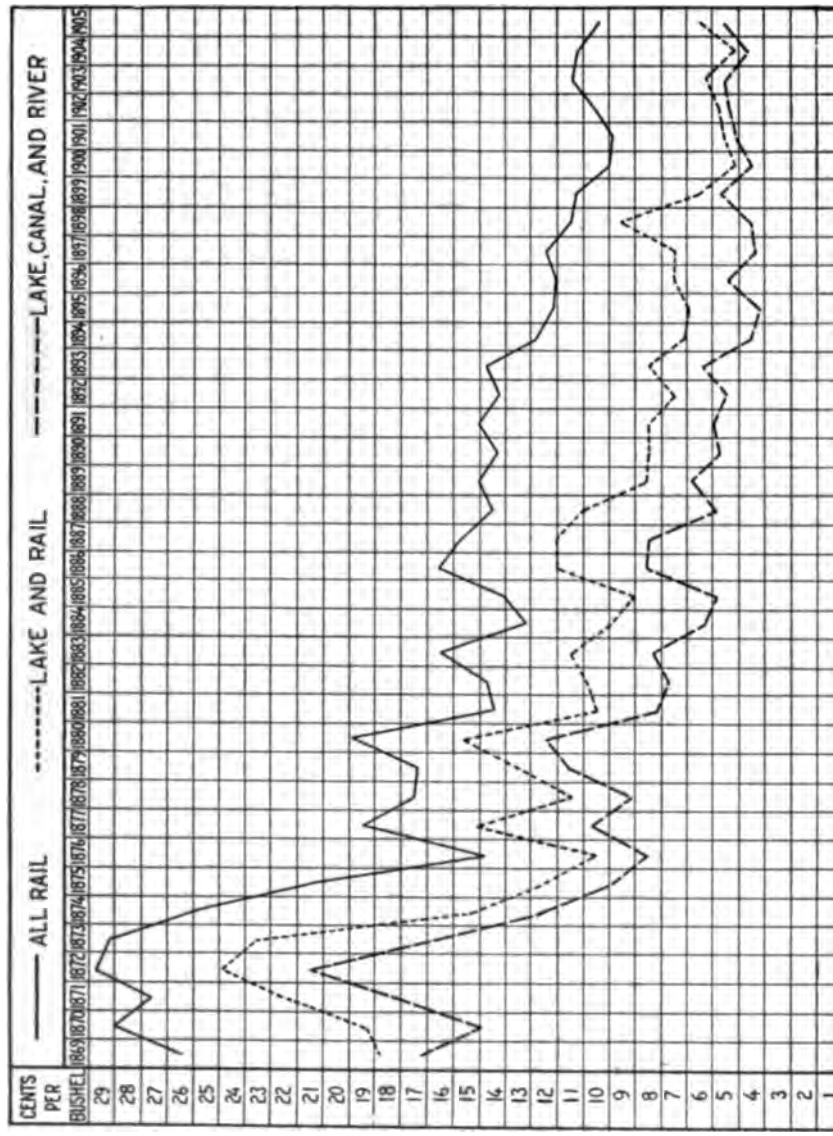

DIAGRAM 4—Average freight rates on wheat from Chicago to New York, 1869–1905 (Table 82)

[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

2. The Ohio and Erie Canal (generally called the "Ohio Canal"), connecting Cleveland, on Lake Erie, with Portsmouth, on the Ohio River, a distance of 309 miles. The Columbus navigable feeder extends from Columbus to Lockbourne on the main canal, a distance of 11 miles; and the Walhonding Canal extends 6 miles westwardly to Roscoe. This gives 326 miles of navigable waterway. Besides this are the unnavigable feeders, the Summit County reservoirs and the Licking reservoir in Licking, Fairfield, and Perry counties. The canal has two summits—one in Summit County and the other at the Licking reservoir. It has a total lockage of 1,218 feet.

The following State canals and parts of State canals have been abandoned: Three-fourths of a mile at the outlet of the Miami and Erie Canal, given to the city of Cincinnati in 1863, ostensibly for street and sewerage purposes, but now occupied by the Pittsburg, Cincinnati, Chicago and St. Louis Railway for terminal and depot purposes; several miles of the Miami and Erie, given to the city of Toledo in 1864 for street and sewerage purposes; 3 miles of the Ohio and Erie Terminal at Cleveland, given to the city in 1872 for city purposes; the entire Hocking Canal, extending from Athens, in Athens County, through Hocking County to the Ohio and Erie Canal at Carroll, in Fairfield County, by acts of 1873, 1876, and 1894; the Granville feeder of the Ohio and Erie Canal in 1876; the Wabash and Erie Canal and the Six Mile Reservoir in 1888 and 1891, and 19 miles of the Walhonding Canal above Roscoe in 1896.[a]

There is one important slackwater improvement in Ohio, the Muskingum River improvement, which was ceded to the United States Government by joint resolution of the Ohio legislature on May 14, 1886. This improvement extends from Dresden, on the Muskingum River, to Marietta, on the Ohio River, a distance of 91 miles. The 75 miles of this river between Zanesville and Marietta have been improved by the United States, so that it stands among the best canalized rivers of this country. The locks are 10 in number and are 175 feet in length by 36 feet in width, with a minimum depth of 6 feet, which admits of the passage of the larger Ohio River boats. When the Government extends the improvement of the Muskingum to Coshocton the State will have to improve only 135 miles of canal to secure a waterway from the Ohio River to Lake Erie.[b]

For admininistrative purposes the State canals of Ohio are divided into three grand divisions:

1. Grand division No. 1, embracing that portion of the Ohio Canal extending from Cleveland to Muskingum slackwater at Dresden, including the 6-mile remnant of the Walhonding Canal.

2. Grand division No. 2, embracing that portion of the Ohio Canal extending from Dresden Junction to Portsmouth, including the Columbus feeder, a distance of 169 miles; also the State's reserved rights in the Hocking Canal.

3. Grand division No. 3, all of the Miami and Erie Canal extending from Cincinnati to Toledo, including feeders and reservoirs.[c]

The Miami and Erie Canal from Dayton to Cincinnati passes through a beautiful and fruitful valley. Along its banks is an almost unbroken chain of factories and mills.

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[a] History of Ohio Canals, pp. 48 and 49.
[b] Annual Report, Board of Public Works, 1905, p. 185.
[c] Annual Report, Board of Public Works, 1905, p. 13.

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[illegible]

[illegible]

cinnati, and the Ohio and Erie Canal, following the old Scioto and Muskingum route from Cleveland to Portsmouth. This choice of routes was due to the desire to secure the greatest development of the State.[a]

Construction was begun July 4, 1825, at Licking Summit, Licking County, and was the occasion of great rejoicing. A loan of $400,000 had been placed by the commissioners and donations had been received from citizens.

On July 4, 1827, the first boat arrived at Cleveland over the Ohio Canal, having descended through 41 locks, passed over 3 aqueducts and through 37 miles of canal. Navigation began on the Miami Canal a little later, 3 boats leaving the basin, 6 miles north of Cincinnati, on November 28, 1827, and proceeding to Middletown.[b]

In 1825 the Ohio legislature memorialized Congress, asking for a donation of land for canal purposes. Congress responded by act of March 2, 1827, granting to the State of Indiana, to aid in the opening of a canal to connect navigable points on the Wabash River with Lake Erie, so far as same was in the State of Ohio, a quantity of land equal to one half of five sections on each side of the canal. This was granted by Indiana to the State of Ohio by joint resolution of the legislature of the State of Indiana, approved February 1, 1834; the number of acres was 292,223.51. A second grant of Congress was by act of May 24, 1828. Its object was to aid in extending the Miami Canal from Dayton to the Maumee River. Its extent was a quantity of land equal to one-half of five sections on each side of the canal. The grantee was the State of Ohio and the acreage amounted to 438,301.32. A third grant by Congress was dated May 24, 1828, "To aid in the construction of canals in Ohio." The extent was 500,000 acres to be selected from land subject to private entry. The actual grant amounted to 439,999.12 acres; thus the total acreage granted to the State by the Government amounted to 1,230,521.95 acres. On the 22d of December, 1828, the legislature of Ohio passed an act accepting the above grants and provisions. From the sale of these lands the State realized the sum of $2,257,487.32, and a small portion valued at about $100,000 still remains unsold. In addition to these grants the State received from individuals and corporations along the different canals donations of lands and rights of way and money.[c]

The canals were constructed, and the traffic built up the population of towns and counties through which the canals passed. The Ohio and Erie Canal was completed in 1833, and the Miami and Erie Canal in 1845.

Between 1825 and 1835 five short lateral canals were constructed by private corporations, which at that time were created only by special act and were not compelled to make reports to the State; hence the impossibility of securing information regarding these private canals. Some of them were aided by the State to the extent of $450,000. These canals were soon abandoned and some were never operated, either on account of lack of sufficient water or lack of business, and the last of them ceased to operate in 1872.

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[a] History of Ohio Canals, pp. 18–21.
[b] History of Ohio Canals, p. 30.
[c] Annual Report Board of Public Works of Ohio, 1905, p. 151.

As a result of railroad building in the fifties the canal traffic declined in spite of the continual lowering of tolls on the canals. Beginning in 1856, and continuing until the outbreak of the civil war, the canals were operated at an annual loss.[a]

The war caused a still further decline in canal traffic, and in 1861, by act of the legislature, passed May 9th, the State leased her public works (canals) to private parties for an annual rental of $20,075. This lease was forfeited on December 21, 1877, and the supreme court of Montgomery county appointed a receiver until May, 1878, at which time the State board again took possession of the public works of Ohio. The amount received as rental from the lessees during the 16½ years was $331,237.50, and during the six months subsequent to the forfeiture $69,765.59, making a total amount received by the State of $401,003.09. The expenditures by the board of public works for "superintendence" and "repairs" ceased with the transfer of the canals to lessees. All expenditures made during that time were for the settlement of prior claims and awards of damages and expenses incurred in the appraisement of personal property sold to the lessees and the payment of outstanding indebtedness, provided for by the act making appropriations for the maintenance of public works, passed May 13, 1861. On the forfeiture of the lease the State took up the canals, but, owing to the bad condition in which they were returned and the lack of adequate appropriations to put and keep them in good condition, they have since been maintained at an annual loss. The only portion of the canals that has made any regular net returns in recent years has been that part of the Miami and Erie extending from Dayton to Cincinnati.

On March 26, 1901, the board of public works entered into a contract with Thomas N. Fordyce and others known as the Miami and Erie Canal Transportation Company by which the company was to operate a canal boat traction plant on the canal. This was popularly known as the "Electric Mule Company," and began propelling canal boats, but soon went into the hands of a receiver.[b]

The grant of the franchise to the Miami and Erie Canal Transportation Co. brought forth much protest from the friends of canal transportation. The company laid a standard-gauge track along the berme bank of the canal, ostensibly for the purpose of running motor cars to tow the canal boats. This track was of heavy material, considerably more than enough to meet any possible requirements for towing canal boats, and the copper wire strung by them was much larger than any other used in the State of Ohio for any railroad purpose. Most of the track and wire was put in between Dayton and Cincinnati, and all the canal boats that were on the canal (some 30 or 40) were bought by the Miami and Erie Canal Transportation Co. Before the project got down to a working basis, however, foreclosure proceedings were brought by trustees for the bondholders on whose holdings no payment of interest had been made for some time prior to the proceedings. These proceedings were begun in the superior court of Hamilton County, but on its appearing that the jurisdiction of that court did not extend outside that county, the action was transferred to the common pleas court, the jurisdiction of which ran throughout the State. Two receivers were appointed by the court,

[a] History of Ohio Canals, p. 43.
[b] History of Ohio Canals, pp. 49 and 50.

Mr. C. C. Richardson of Lockland, Ohio, and an official of the Cleveland Traction Company. Both of these receivers had been interested in the original organization of the company. The present receivers (June, 1907) are Mr. Richardson and Mr. W. C. Shepherd, a lawyer of Hamilton, Ohio. The receivers were directed to sell the property of the company, which they have been doing, selling the wire, machinery of the substations, etc., and some of the track itself, most of which has been removed. At last accounts they still retained some of the property, the motors, the canal boats, etc., which they were trying to sell.

A suit has been filed by the State of Ohio, at Columbus, to determine whether the franchise has been forfeited. This suit is still pending.

Another suit in the United States court for the southern district of Ohio by the bondholders against the original stockholders and the promoters is pending, but to this latter suit the company itself is not a party. The plaintiffs in this case claim bad faith in the defendants.

It is estimated that the canal property remaining, even after all the encroachments and abandonments, is worth $15,000,000. For a long time there has been a sentiment against the abandonment of the canals. While they are not in a condition to dictate freight rates, yet they would become competitors with railroads running north and south if they were put on a practical basis. They were originally intended for boats of 80 tons burden, but the structures, locks, etc., are such that the canal could be improved to a depth of five feet by building new structures, which would involve a cost of not more than $1,500,000.[a]

The canal debt was wiped out in 1903.

There has been a general awakening among the people of Ohio in recent years as to the importance of preserving the canals of the State, and, as a result, a more thorough understanding of the true value of the property. The seventy-second General Asembly authorized the appointment of a legislative commission to investigate the canal system of Ohio, and another commission was appointed in 1902 by the seventy-fifth General Assembly. The latter commission earnestly advised the retention and improvement of the canals, and in view of the great possibilities and the direct and indirect advantages of the canals they did not consider that an expenditure of a sum not to exceed $1,500,000 would be excessive.

Through the solicitations of large business interests and memorials of corporate bodies the Government has taken up the subject of improving the Ohio canals. The Fifty-third Congress passed an act which resulted in the appointment of the Poe Commission by the Secretary of War under the provisions of the river and harbor act of August 17, 1894. This commission considered the feasibility of constructing a continuous canal to connect the waters of Lake Erie with the Ohio River, and reported, after a careful consideration of the subject, that it would not be advisable for the Government to build such a waterway, unless it were of sufficient dimensions to meet the present demands of interstate commerce. The commission reported in favor of the construction of a canal of 10 feet draft and declared the project to be one of undoubted practicability at a cost

[a] History of Ohio Canals, p. 138.

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[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The northern branch of the Ohio and Erie Canal passes through an almost unlimited coal field for 60 or 70 miles. The city of Cleveland is rapidly extending up the Cuyahoga River, with which this canal connects During the year ending November 15, 1905, 4,973,950 pounds of coal arrived at Cleveland and 4,875,720 pounds were cleared. The clearance of coal at Canal Dover amounted to 27,904,000 pounds. During the same period on the Miami and Ohio Canal, at Cincinnati, 64,090,000 pounds of sand, 8,442,000 pounds of ice, and 2,286,999 pounds of paper arrived, and 3,475,275 pounds of rags and paper stock were cleared. At Lockland were cleared 3,498,000 pounds of ice and 3,219,207 pounds of paper, while 2,695,867 pounds of rags and paper stock arrived. Other traffic on these canals consists of iron, farm produce, lime and cement, lumber and other merchandise.[a]

The State of Ohio has appropriated some $250,000 for the improvement of the locks and dams in the Miami and Erie Canal between Dayton and Cincinnati, and for the deepening of this portion of the canal to a depth of 5 feet. The canal is considerably run down. Mr. Richardson, the receiver (who is also auditor of Hamilton County), stated that in places it was almost possible for a person to step across the canal. Work under the appropriation is going forward between Lockland and Dayton. The only portion near Cincinnati in which there is any traffic is between Cincinnati and Lockland, although the upper part between Defiance and Toledo is said to be in fair condition, being 100 feet wide at places and having a depth of 6 feet. Between Cincinnati and Lockland, the Ohio Boat Company, composed chiefly of paper manufacturers of Lockland, operate 7 boats, having in 1907 1 boat in idleness at Dayton shut off by the work of improvement then being done. The boats of the Ohio Boat Company handle chiefly paper from the mills at Lockland, which they carry to Cincinnati, and they take rags back to the mills together with such freight as may offer. The company pays the regular toll charges to the State. Mr. George B. Fox, president of the Fox Paper Company at Lockland, is treasurer of the Ohio Boat Company. The boats of the Ohio Boat Company are propelled by gasoline. The Clifton Springs Distilling Company has 2 canal boats, which they operate between their distillery at Cumminsville and Cincinnati, sending a boat to Cincinnati every day and a second boat two or three times a week. Four boats bring sand into Cincinnati from the sand banks adjacent to the canal between Cincinnati and Lockland. Both the whisky and the sand boats are towed by animal power.

The traffic on this end of the canal is seen to be unimportant. The Bureau has no definite information of the movement between Dayton and Toledo, nor between Dayton and Defiance, except that it was stated that the latter section had no traffic movement of any account at all.

The whole situation on the canal seems chaotic. As Mr. George B. Fox, treasurer of the Ohio Boat Company, said, "Nobody seems to know anything about it." Mr. Fox is probably as well informed on the subject of the canal, at least as far as the southern end of it is concerned, as anybody.

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[a] Annual Report of the Board of Public Works, Ohio, 1905, pp. 43 to 50.

CANALS IN ILLINOIS

[illegible] AND [illegible] CANAL

[illegible]

[illegible]

[illegible]

and 1833 the time limit for commencing the canal was extended to 1837 and the time for its completion to 1852. After the failure of the commission of 1835 to begin work it was evident that the canal rights given by Congress would be lost and the lands granted would revert to the United States unless prompt measures were taken to begin the construction of the canal and push it to completion. Under these circumstances the governor called the general assembly to meet in extra session on December 7, 1835. Accordingly, on January 9, 1836, an act was passed directing the governor to appoint "the board of commissioners of the Illinois and Michigan Canal" and empowering him to negotiate a loan of $500,000 to aid in the construction of the canal. Under the administration of this new board rapid progress was made, and it may be said that the year 1836 marks the real beginning of the building of the canal. In their first annual report for the year 1836 the board gives in detail the plans of the improvements contemplated, the estimated cost of the same, together with a report of the actual work done. The dimensions of the canal were somewhat larger than had been previously planned. It was to be 6 feet deep, 60 feet wide at the surface, and 36 feet wide at the bottom, with locks 110 feet by 18 feet.

At the end of 1837 the board reported 52 miles under contract, which at the contract prices would cost $3,244,234.97. By the end of 1840 the board had expended nearly $4,000,000, and at the end of the year 1842 the work completed and under contract had cost $6,751,006.21, and it was estimated that about $1,250,000 more would be necessary to complete the work.

At this time the credit of the State was prostrated and many people were disheartened with the canal undertaking. The chief engineer of the canal board in a report undertook to show the advantages that would come to the State through the completion of the canal, and pleaded for means to prosecute the work to a finish. In February, 1843, the general assembly authorized the governor to borrow $1,600,000 on the pledge of the canal property and tolls. This act provided for a board to be known as the "board of trustees of the Illinois and Michigan Canal," one of which trustees to be appointed by the governor and the other two to be elected or appointed by the subscribers to the canal loan or the holders of certificates of indebtedness. This act provided that the property and assets of the canal should vest in this board of trustees and that when the trust created should be executed the canal and canal property should revert to the State. Under the trustees, who were first selected in 1845, the work was pushed to completion, and on April 24, 1848, the chief engineer reported the canal so far completed as to be navigable, and that the first boat had passed through the entire length of the canal from La Salle to Chicago, arriving at the latter city on April 23. As a matter of interest the engineer later reported that this first boat brought some sugar originating at New Orleans and that this sugar reached Buffalo on April 30 via Mackinac.[a]

As completed in 1848 the canal had the dimensions planned in 1836, but the summit level was 9 feet higher than then planned, reducing the

[a] Documentary History of the Illinois and Michigan Canal from 1822 to 1848, in Report of the Canal Commissioners of Illinois, 1900.

[illegible] the [illegible] necessary principal works at Rockport. In 1963 the city of Chicago was authorized to make the [illegible] the minimum level [illegible] and the work was completed in 1971.

The canal remained under the [illegible] until 1971 when it was turned over to the State in accordance with the act of 1963. Since the relinquishment of the board of trustees the property has been under a board of canal commissioners.

By the time of the completion of the canal work in 1965 the State had expended $[illegible]. The total expenditure is estimated at $[illegible]. In 1971 the [illegible] appropriated $[illegible] to the city of Chicago for the [illegible]. This makes the total cost of constructing the canal $[illegible]. Prior to the completion of the work the State [illegible] considerable consideration in [illegible] to make [illegible] for the preservation of the work, but the [illegible] were discharged during the administration of the [illegible] as well as the cost of maintenance and operation from [illegible] from the sale of canal land and the earnings of the canal itself. It is [illegible] that as the canal property [illegible] in [illegible] the State [illegible]. The [illegible] and maintenance [illegible] have [illegible] of the [illegible] of the Federal and State [illegible]. It is [illegible] to [illegible] the [illegible]. In the [illegible] shows that the [illegible] from the [illegible] in 1965 [illegible] $[illegible] and the [illegible] from [illegible] $[illegible] a total of $[illegible]. This [illegible] a [illegible] of $[illegible]. Since 1965 the [illegible] expenditure data [illegible] the [illegible] from [illegible] and [illegible] from [illegible] and power [illegible] of which [illegible] is [illegible].

TABLE [illegible]—[illegible] [illegible] [illegible] [illegible]—[illegible]

Year	[illegible]	[illegible]	[illegible]	Total
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 84—*Expenditures and receipts, Illinois and Michigan Canal, 1848–1902*—Continued

Year.	Ordinary repairs.	Extraordinary repairs, renewals, and hydraulic works.	Gross expenses.	Tolls.
1875	$46,241	$28,270	$74,511	$107,081
1876	42,418	49,167	91,585	113,293
1877	54,965	55,053	110,018	96,913
1878	43,826	39,013	82,830	84,330
1879	44,077	53,625	97,701	89,065
1880	47,604	77,997	125,601	92,296
1881	53,597	54,626	108,223	85,130
1882	57,309	48,103	105,412	85,947
1883	56,515	60,241	116,756	77,975
1884	55,731	43,549	99,280	77,102
1885	47,659	38,734	86,393	66,800
1886	44,101	28,329	72,430	62,516
1887	43,509	27,876	71,385	58,024
1888	43,605	33,240	76,845	56,028
1889	42,907	42,571	85,478	63,005
1890	40,258	34,867	75,125	55,112
1891	43,501	29,091	72,592	49,557
1892	43,476	23,661	67,137	54,937
1893	39,063	20,459	59,522	38,702
1894	36,985	17,273	54,258	44,928
1895	33,760	37,392	71,152	39,106
1896	31,541	46,446	77,987	32,100
1897	31,524	36,783	68,307	33,065
1898	30,859	19,342	78,986	38,570
1899	31,768	22,368	91,196	41,021
1900	31,205	36,805	88,317	13,867
1901	36,928	54,945	111,002	8,120
1902	25,413	81,599	127,150	2,879
Total	2,322,206	2,168,937	4,616,562	6,587,826

The foregoing table shows that the receipts from tolls reached the high-water mark in 1866, when the collections amounted to more than $300,000. Since that time the tolls have diminished almost constantly. In 1900 there was a great decrease as compared with the previous year, and in 1902 the receipts amounted to less than $3,000.

The importance of the canal as a commercial factor is best indicated by a comparison of the tonnage from year to year. The statement below will afford opportunity for comparing the operations of the canal from 1860 to 1902, inclusive.

TABLE 85—*Movement of canal boats on the Illinois and Michigan Canal, 1860–1902*

Date.	Clearances.	Boats running.	Miles run.	Tons transported.
1860	2,926	201	235,684	367,437
1861	6,339	194	415,509	547,295
1862	7,044	211	474,976	673,590
1863	5,810	240	118,713	619,599
1864	4,527	288	300,340	510,286
1865	3,907	288	360,614	616,140
1866	5,488	230	406,784	746,815
1867	4,183	209	357,623	746,815
1868	4,128	218	345,169	737,727
1869	4,524	219	285,050	817,738
1870	2,903	179	246,650	585,975
1871	3,523	186	278,948	628,970
1872 [a]	5,018	173	334,820	783,641
1873	4,743	172	328,164	849,533
1874	4,296	152	288,075	712,020

[a] After 1872 the above table includes clearances from the locks at Henry and Copperas Creek on the Illinois River.

TABLE [illegible]—Movement of [illegible] in the [illegible] and [illegible], [illegible]—[illegible]

Date	[illegible]	Boats [illegible]	Miles run	Time [illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

TABLE [illegible]—[illegible] in the [illegible] and [illegible], [illegible]—[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

cutlery, groceries, etc., was heaviest in 1895, but in no year was the movement of this class of goods very large.

The rates of toll and lockage have not been changed in any important particular since 1892. The tolls are computed at so many mills per thousand pounds per mile unless otherwise stated.

TABLE 87—*Rates of tolls and lockage on the Illinois and Michigan Canal*

By resolution of the board of canal commissioners adopted in April, 1899, to take effect upon the opening of navigation.

On freight boats per mile on the canal, 3 cents.

Lockage at Henry and Copperas Creek on all boats of 150 tons and under shall be $1.50, and this charge shall be made at each lock.

On boats of more than 150 tons measurement lockage shall be charged at the rate of 1 cent per ton measurement, and this charge shall be made at each lock: *Provided*, That on boats passing through the lock in fleets of two or more, engaged in regular traffic, requiring only a single lockage, the lockage charge, by ton measurement, or otherwise, may be divided between said boats at each lock.

The lockage of cabin boats, in tow of steamers or canal boats, shall be 25 cents each; fuel boats in tow of steamers, 50 cents; rowboats in tow of steamers or canal boats, 10 cents each.

No lockage on boats shall be made for less than $1.50. Cargoes must be charged for as hereinafter indicated, in addition to lockage charge on boats.

Toll is to be computed upon the weight (1,000 pounds per mile) of all articles contained in the following list, unless otherwise stated.

Lockage at Henry and Copperas Creek to be computed upon the weight (1,000 pounds) unless otherwise stated.

Article.	Through freight.	Local freight.	Lockage.
	Mills.	*Mills.*	*Cents.*
Barbed wire	¾	¾	3
Bark, tanner's	1	1	1½
Barley	9/16	¾	1½
Barrels, empty	2	2	3
Beans	1	1	3
Bran	1	1	3
Buckwheat	9/16	¾	1½
Charcoal	1	1	3
Clay	½	½	3
Coal, per ton per mile	½	½	3
Coke	½	½	3
Corn	9/16	¾	1½
Drainage pipe	1	1	3
Flour	1	1	3
Furniture, household	2	2	3
Hay and fodder	1	1	3
Hemp	1	1	3
Hoops and materials for	1	1	3
Hubs, boat knees, and bolts	1	1	3
Ice	1½	2	1½
Iron:			
Pig, scrap, and railroad	¾	¾	2
Wrought and cast	1	1	3
Iron ore	½	½	2
Land plaster, bone dust, and superphosphate	1	1	1
Lead pipe, sheet and roll, pigs and bars	1	1	3
Lime:			
Common	1	1	2
Hydraulic	1	1	2
Machinery	2	2	3
Meal	1	1	3
Merchandise (including hardware, dry goods, cutlery, groceries, crockery, and other articles not specified)	1	1	3
Oats	9/16	¾	1½
Rye	9/16	¾	1½
Salt, in sacks and barrels	1	1	2
Sand and other earth	½	½	1
Seeds	1	1	3
Ship stuff	1	1	3
Shorts and screenings	1	1	3
Staves and headings	1	1	3
Wheat	9/16	¾	1½
Zinc, spelter	1	1	3

On the following articles toll per mile and lockage will be computed by number and measures:

Article.	Through freight.	Local freight.	Lockage.
	Mills.	*Mills.*	*Cents.*
On each 1,000 feet of lumber.....per mile..	.....	5	5
On each 1,000 feet of dressed flooring.....do....	.....	4	5
On each 1,000 feet of siding.....do....	.....	2	2½
On each 1,000 lath.....do....	.....	1	1½
On each 1,000 shingles.....do....	.....	½	1
On each 1,000 brick.....do....	2	2	5
On each 100 split posts (not over 5 inches in diameter) or fence rails.do....	3	4	5
On each 500 railroad ties.....do....	15	20	8
On each cord of wood for fuel [a].....do....	8	10	8
On each cubic yard (27 cubic feet) dressed or sawed stone [b].....do....	7	8	15
On each cubic yard (27 cubic feet) rubble stone [b].....do....	4	5	10
On each cubic yard (27 cubic feet) dimension stone [b].....do....	6	8	15
On each cubic yard (27 cubic feet) macadam stone [b].....do....	2	2	9
Passengers (each round trip of 25 miles or less on canal), 2½ cents each..	.....	.....	5

[a] Provided that on wood transported over 25 miles, the toll shall not exceed 25 cents per cord. All timber on boats shall be taken board measure.

[b] Provided that on stone transported over 25 miles, the toll shall not exceed 12½ cents per cubic yard on macadam and rubble and 20 cents per cubic yard on dimension and dressed or sawed stone.

"Through freight" is that which is cleared from Copperas Creek or Henry to Chicago; or from Chicago to Henry or Copperas Creek.

"Local freight" includes all other freight.

The importance of the canal is not fully measured by its traffic, but its influence upon railroad rates in the territory adjacent must be taken into account in any estimate of the sum total of benefits accruing to commerce. Complete data for a comparison of freight rates from Chicago are not at present available.

CHICAGO SANITARY AND SHIP CANAL

This canal has been constructed under an act of the legislature of Illinois, passed in 1889, authorizing the formation of sanitary districts. As was expected, the only district created has been the Sanitary District of Chicago (including some portions of Cook County outside of the city), with an elected board of trustees, for the construction of a drainage canal to protect the waters of Lake Michigan from sewage pollution. The main drainage canal from Robey street, Chicago, to Lockport, a distance of 27.15 miles, was completed and opened in January, 1900. The expenditures up to that time were over $25,000,000; but additional work has made the total cost of constructing the main channel, including right of way, excavation, river improvements, dams, bridges, pumping plants, etc., to December, 1905, approximately $42,000,000. In addition there had been about $8,000,000 expended for interest, maintenance, and miscellaneous charges. The larger part of the expenditure has been met by direct taxes, but a bond issue of $20,000,000 was authorized, to run for twenty years, one-twentieth to be retired annually. In 1906 the bonds outstanding amounted to $17,180,000.

Still further expenditures have been made for connecting works and for the development of electrical energy from the water power, and some income is received from leases of power, wharfage, and rents. The plans of the sanitary trustees include the drainage of the Evanston and Calumet additions, the widening of the Chicago River and the main channel, and the extension of the main channel to Lake Joliet.

The dimensions of this canal are much larger than was necessary for drainage purposes. It is 22 feet in depth, and its typical cross section is 292 feet in width at the water surface and 202 feet at the bottom. The size of the canal was determined by the views of its projectors that it should eventually form part of a great ship canal connecting the Great Lakes with the Mississippi. But as yet it is not used for traffic purposes.

CANALS IN NEW JERSEY

DELAWARE AND RARITAN CANAL

The main line of the Delaware and Raritan Canal extends from Bordentown, N. J., to New Brunswick, in the same State, a distance of 44 miles, and connects the Delaware and Raritan rivers. A feeder 22 miles long, used for navigation purposes, unites Raven Rock, N. J., with Trenton, the capital of the State, where it connects with the main canal, the total length of canal and feeder thus being 66 miles. The surface width of the main line is 80 feet, with a depth of about 8 feet. The canal was completed about the year 1838, at an estimated cost of $2,500,000. The census reports the total cost of construction and improvements to 1906 as $5,113,749. No recent improvements appear to have been made on the canal. The period of navigation is ten months, beginning in March and ending in December. The canal appears to be both a towpath canal and a ship canal, animal power being used when vessels have no means of propulsion of their own. The main line has 13 locks, with a length of 210 feet, and a width to pass clear, 23 1/4 feet. The Census of 1880 reports that the banks of the main canal are walled the entire length, and that steam vessels navigate the main canal.

History.—The Delaware and Raritan Canal Company, the original owner of this waterway, was incorporated February 4, 1830, by a special act of the New Jersey legislature. The company was empowered under its charter to construct a canal and feeder, as well as to make river improvements. The company was endowed with the usual powers of a corporation and was also authorized to construct all necessary locks, works, wharves, and storehouses, and to secure land for its bed, being empowered for that purpose to institute condemnation proceedings whenever necessary. It was made unlawful for any other corporation or individuals to construct another canal within 5 miles of any point on that of the company. The State retained the power for ten years to subscribe for one-fourth of the capital stock. The construction was to be commenced within two years and completed in eight, and at the expiration of thirty years therefrom the State was to have the privilege for ten years of taking the works at an appraisement not exceeding, however, the first cost. By subsequent act of the legislature, passed February 3, 1831, the time for making such appraisement was extended to fifty years, and until after the time limit for construction of the canal the construction of any railroad within 5 miles of any point thereon was prohibited, and thereafter the company was to have the refusal of constructing any such railroad.

On February 15, 1831, the legislature passed an act by which the Delaware and Raritan Canal Company and the Camden and Amboy Railroad and Transportation Company were allowed to consolidate their stock, each company, however, retaining its separate organiza-

[illegible]

[illegible]

[illegible]

Traffic.—The canal company itself is not engaged in transportation, but the Pennsylvania Railroad Company owns 21 canal boats which are used in the operation of the canal under the lease by that company of the United New Jersey Railroad and Canal Company's property. Various other individuals, partnerships, and corporations operate boats on the canal, including the Trenton Transportation Company, Easton and McMahon Transportation Company, Philadelphia Lighterage and Transportation Company, Peter Hagan & Co., The Standard Oil Company, J. S. Hoskins Lumber Company, Maxwell & Company, and Charles H. Gallagher.

The number of vessels entering and leaving the canal in 1904 was as follows:

Class of vessel.	Boats operated.	
	1904.	1905.
Tow	1,764	2,280
Steamers	1,067	1,056
Rafts	40	122
Electric, etc	455	554
Total	3,326	4,012

The freight passing through this canal is composed largely of stone, sand, lumber, coal, and general merchandise. The annual tonnage for the past ten years is as follows:

Year.	Tons.	Year.	Tons.
1897	595,375	1902	473,375
1898	546,083	1903	422,492
1899	606,961	1904	464,518
1900	584,112	1905	441,735
1901	513,531	1906	395,753

The articles of merchandise shipped over the canal in 1904 and 1905 were distributed as follows (arranged as per schedule of the canal company furnished the Bureau of Corporations):

TABLE 88—*Traffic on Delaware and Raritan Canal, 1904, 1905*

Articles.	Tonnage.	
	1904.	1905.
Stone [a]	57,778	73,596
Clay [a]	5,470	4,302
Sand [a]	26,964	34,880
Brick [a]	3,989	5,427
Iron [a]	14,318	20,943
Logwood [a]	1,298	4,140
Lumber and piling [a]	8,689	23,074
Oil [a]	3,516	3,056
Ores [a]	846	351
General merchandise, etc. [a]	101,055	69,303
Anthracite coal:		
Eastbound	66,918	76,699
Westbound	94,321	92,626
	161,239	169,325
Bituminous coal:		
Eastbound	72,410	24,214
Westbound	5,309	6,721
	77,719	30,935
Coke [b]	1,637	2,463

[a] Eastbound and westbound, tonnage in each direction is not kept separately.
[b] *All eastbound.*

According to the managers of the canal, railroads do not prorate with the canal company, or with any of the transportation agencies operating on the canal.

Finances.—According to the statement of the canal managers to the Bureau of Corporations, the gross earnings for 1904 were $268,564.62, operating expenses $378,484.90, excess of expenses $109,920.28. In 1905 gross earnings were $298,937.86, operating expenses $413,382.75, excess of expenses $114,444.89.

Tolls and towage charges.—A comparison of the canal tolls and towage charges in the rate sheets issued by the Pennsylvania Railroad Company for 1906 (March 12) and 1907 (March 1) will show the discrimination in favor of the lessee company.

In both rate sheets the regular tolls on freight cargoes are the same, as follows:

Classification.		Way, per mile.		Through.
		Cents.	Mills.	
First class	per 2,240 pounds	3	5	$1.50
Second class	do	3	.....	1.20
Third class	do	2	5	.70
Fourth class	do	1	5	.45
Fifth class	do	1	2	.40
Sixth class	do	1	.....	.35

In the rate sheet for 1906 a special classification is enumerated for articles in quantities of 30,000 pounds or upwards; for smaller quantities articles were rated according to rail line Official Classification. In 1907, the whole table of tolls is "governed by the Official Classification."

The rate sheet for 1906 states that the tolls named "apply only to boats and vessels when towed over the company's (Pennsylvania Railroad's) steam towage routes by its own steamers or contractors, and the right is reserved to charge full legal rates, or any parts thereof, on the cargoes of any vessels, boats, or rafts which shall violate any published rules, or be towed by any tugs or teams not belonging to, employed by, or under contract with, the lessee of the canal." It is further provided that "when boats tow between New York and New Brunswick, and between Bordentown and Philadelphia, other than by the company's or contractor's steamers, the tolls on the canal will be 50 per cent above these rates; when towed by companies or contractor's steamers on one end and by other parties on the other end, 25 per cent; provided, that such charge does not exceed 4 cents per ton per mile." These provisions do not appear in the rate sheet for 1907; and apparently this discrimination in favor of the company and its contractors was given up.

Boats carrying full cargoes of 5th and 6th class freight one way (in 1906 cargoes of pig iron, iron and lumber), if in good condition, are free of boat tolls and lockage, both going and returning, excepting way boats which are charged $1 each way for passing Wellsfalls Outlet Lock; on all vessels and boats with exceptions indicated below, carrying cargoes other than the above, 4 cents per mile and 4 cents for passing each lock and $1 each way for passing Wellsfalls Outlet Lock.

In both rate sheets the following boat tolls are given on transient empty boats, including lockage charge:

Boats of capacity of—	
10 tons or less	$2.28
11 tons to 50 tons	5.00
51 tons to 100 tons	6.50
101 tons to 150 tons	8.00
Over 150 tons	10.00

Vessels going through light are charged $10, steamers with merchandise other than full cargoes of class 4, 5, and 6 freight, are charged $10 (in 1906 $20), in addition to regular toll on cargo. Steamers with solid cargoes of 100 tons or more, fourth, fifth, or sixth class freight, passing through the canal pay regular rate per ton on cargo (and in 1906), $2.28 boat toll. The 1906 rate sheet contains the following, which does not appear in the 1907 sheet:

When such steamers have consort in tow with similar cargo, the consort will pay the same rate and boat toll as charged on the steamer. The same vessels returning light will pay $2.28 boat toll. On all sail vessels loaded with vegetables, melons, and fruit, the boat toll will be $2.28 each way.

Team towage on canal is payable to the contractor furnishing such towage on the line of the canal at the following rates in both years: Between Bordentown and New Brunswick boats not exceeding 150 tons capacity, $7 each way and for cargo 6 cents per ton additional. Boats exceeding 150 tons capacity $10 each way, and for cargo 6 cents per ton additional. Between Trenton and New Brunswick, boats less than 150 tons capacity, $6 each way, and for cargo 6 cents per ton additional. Boats exceeding 150 tons capacity, $7 each way, and for cargo 6 cents per ton additional.

The following are the rates for both years, in cents, for steam towage, eastbound, from Philadelphia harbor points named to Bordentown, and from New Brunswick to New York and other points named, on minimum of 100 tons:

TABLE 89—*Rates of steam towage, Delaware and Raritan Canal*

[Per ton of 2,240 pounds]

To—	From—			
	Schuylkill River.	Greenwich wharves.	Port Richmond (Philadelphia).	New Brunswick.
Bordentown	14	8	7	.....
Sayersville	18	12	11	4
Points below Sayersville (South Amboy)	20	14	13	6
Keyport	32	26	25	18
Perth Amboy	22	16	15	8
Points between Perth Amboy and Buckwheat Island	24	18	17	10
Elizabethport	26	20	19	12
Newark	32	26	25	18
Hudson City	33	27	26	19
Lodi, Hackensack, and Sandy Hook	43	37	36	29
Lodi and Hackensack in Lehigh boats	48	42	41	34
Bergen Point	28	22	21	14
To points between Bennetts Dock, Bay Ridge, and Locust Grove	36	30	29	22
New York Harbor limits	31	25	24	17
Staten Island: Mariners Harbor, Vanderbilts Landing, and intermediate wharves. Long Island: Bennetts Coal Wharf, Bay Ridge, Twentieth street, Gowanus, First Bridge, Newtown Creek, Washington avenue, Long Island City. New York: East River (Ninetieth street), North River (Sixty-first street). New Jersey: Upper Coal Wharves, Weehawken, National Storage Company's Wharf, Communipaw.				

[illegible]

[illegible]

[illegible]

capital. It has earned this in the past, he maintains, and can earn it in the future. Where the terminals are both on water, canal rates are cheaper than railroad rates by 50 per cent. He further explained that when Mr. Cassatt of the Pennsylvania first became president he constructed a railroad called the "New York, Philadelphia and Norfolk" over the Delaware Peninsula from Cape Henry, for the purpose of carrying southern lumber from the Chesapeake via Delmar and Wilmington to Philadelphia. For a number of years this railroad was operated in competition with the water route, and, it is said, at a loss. At length this particular traffic was abandoned and the principal freight now carried by it is fruit.

This representative of the Chesapeake and Delaware Canal further maintained, as a general proposition, that the relative cost of transportation as between water and rail is in proportion of 30 to 100; where tolls are added, 50 to 100.

Referring to the Delaware and Raritan Canal, a canal broker at New York City stated that it is so managed by the Pennsylvania Railroad as to greatly hinder its use by shippers. Besides the number and variety of tolls and other charges imposed, if more than one consort is carried by tow steamers the tolls are doubled, which has the effect of making transportation by this canal unprofitable in competition with transportation by rail. Otherwise shippers and forwarders would be able to make through rates by water from Philadelphia to Buffalo, which is now impossible.

The permits issued by the Pennsylvania Railroad Company for boats moving through the canal are interesting. Two sets of these permits, furnished the Bureau along with the schedule of the canal, tend to show that different forms are employed. A yellow slip, or pass, is evidently intended for coal barges. These coal passes are attached to stubs, each stub giving the number, date, permit, boat, captain, tons, amount of coal, destination, shipper, tolls, and steam towage blanks. The permit has a corresponding number, and is issued in the name of the Pennsylvania Railroad Company on behalf of the Delaware and Raritan Canal, and corresponds to clearance papers, permitting the boat to pass from one point to another, blank spaces being left for charges or tolls on lading, boat tolls, and steam towage, and blank spaces being left for the signature of the collector, showing that the charges have been paid or otherwise settled. A second stub provides for the name of the boat, and is evidently a pass to be given up at certain locks. A second slip or clearance paper is printed on white paper and is evidently intended for boats carrying freight other than coal, the form and substance being similiar to that of the papers for boats carrying coal.

Relation of Delaware and Raritan Canal to Raritan River

The Raritan River, according to the report of the Government engineers, is a medium-sized stream flowing through the central part of New Jersey and emptying into Raritan Bay, at Perth Amboy. It is navigable to New Brunswick, N. J., a distance of 12 miles, where it is the eastern terminus of the Delaware and Raritan Canal. The commerce of the river is principally in coal, ores, lumber, building material, and general merchandise, and, according to the statistics of the Government engineers, shows a declining tonnage. The com-

[illegible]

[illegible]

of the act the State might take the canal and its appurtenances, paying the fair value thereof, to be fixed by commissioners; and in case this should not be done, then its charter should be continued for the further term of fifty years, when it should cease and the canal and its appurtenances become the sole property of the State.

By act of February 23, 1829, the company was authorized to borrow $500,000 and mortgage the canal and other property to secure payment, and further powers of mortgaging were given by act of January 28, 1830. By supplement of January 19, 1835, the capital of the company was increased to the extent of $1,000,000, and on March 5, 1836, authority was given still further to increase it to the extent of $600,000.

By virtue of authority given, the company, on March 29, 1830, mortgaged the canal with other property for $750,000 to Wilhelm Willink, jr., of Amsterdam. A bill to foreclose this mortgage was filed October 20, 1841, and the foreclosure proceedings resulted in the sale of the canal and property by a master in chancery, who executed deed of same October 21, 1844, to Benjamin Williamson, Asa Whitehead, and John J. Bryant, for the sum of $1,000,000.

The purchasers reorganized the Morris Canal and Banking Company, and on February 9, 1849, by further supplement to the charter, the legislature, after reciting the sale, authorized the reduction of the number of shares to 10,250 common shares and 11,750 preferred shares of the par value of $100 each. These constitute the present capital stock of $2,200,000.[a]

The canal remained in the hands of its stockholders until 1871, when by authority of a special act of the legislature passed March 14, 1871, it was leased in perpetuity to the Lehigh Valley Railroad Company by indenture dated May 4, 1871. By the terms of this lease the lessee agreed to pay as rentals the interest on the then outstanding debts of the canal company, amounting to $1,125,129.50, and also 4 per cent per annum on its common stock and 10 per cent per annum on its preferred stock.[b]

Capital stock and indebtedness.—The amount of authorized capital is $2,200,000, all of which is issued and is now outstanding. Of this amount, $1,025,000 represents common and $1,175,000 preferred stock. The Lehigh Valley Railroad Company owns $318,300 of the common "consolidated" stock and $271,400 of the preferred stock. The amount of bonds and other indebtedness is reported as $56,835 in scrip and $500,000 in bonds, all of which is owned by the Lehigh Valley Railroad Company.

The Lehigh Valley Railroad Company, under the lease, agreed, among other things, to provide for the payment, extension, or renewal of the loans of the canal company, and the latter stipulated to execute new mortgages as occasion might arise. Part of these obligations were subsequently funded into a mortgage for $1,000,000, dated August 2, 1876. The lessee was authorized to sell from time to time any real estate of the canal company not required for canal purposes and to use the proceeds toward the payment of the debts of the canal company.

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[a] Report of the commissioners appointed under concurrent resolution [of the New Jersey Legislature] of March 31, 1903, to investigate and report upon the abandonment of navigation of the Morris Canal, pp. 49 and 50.

[b] Ibid., pp. 47–49.

[illegible]

Loans outstanding secured by mortgage under [illegible]	$500,000.00
Balance [illegible]	[illegible]
Total	[illegible]

Note one. [illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

The gross earnings for 1904 and 1905, as reported in the schedule of the company, were $96,231.27 and $86,155.02, respectively. During these two years the expenses were $162,442.31 and $163,658.54, leaving a loss in 1904 of $66,211.04, and in 1905 of $77,503.52. During these years, however, the payment of dividends on the capital stock was maintained by the Lehigh Valley Railroad Company. These payments amounted to 10 per cent, or $90,360, on the preferred, and 4 per cent, or $28,268, on the common or consolidated stock. No payment of dividends was made by the Lehigh Valley Railroad Company on stock held by it, nor on the scrip or bonds of the canal company, all of which latter are owned by the railroad company.

4. Taxation and assessment.—According to the annual report of the State board of assessors of New Jersey for 1905, the valuation and assessment of the Morris Canal for State and local uses for that year was as follows:

Assessed valuation except for real estate used for canal purposes other than waterway and tangible personal property	$2,781,000.00
Assessed valuation of tangible personal property used in State commerce	63,046.00
Total assessed for State uses	2,844,046.00
Assessed valuation of real estate for canal purposes other than waterway	448,667.00
Total assessed valuation	3,292,713.00

The tax was as follows:

For State uses	14,220.23
For uses of taxing districts used for canal purposes other than waterway	11,172.24
Total tax	25,392.47

The above figures do not vary much from those given in prior reports for several years preceding.

Traffic.—The character of the commodities moving through the canal is shown in the table below.

Article.	Tonnage.		Direction.
	1904.	1905.	
Wood	2,320	1,780	East.
Brick	5,094	282	Do.
Sand	3,681	.....	Do.
Crushed stone	6,701	.....	Do.
Iron pipe	.....	25	Do.
Do	63	.....	West.
Lumber	2	.....	Do.
Coal	66,582	53,762	East.
Do	.....	19,719	West.

A greater amount of coal is carried on the canal than of all other commodities combined. The only freight besides coal carried on the canal during the season of 1906 was 22 cargoes of wood of 40 tons each and one cargo of 60 tons of brick.

The total tonnage carried in 1866, the year of greatest prosperity, was 889,220 tons; in 1870, 707,572 tons; and in 1871, 629,044 tons. During the five succeeding years after the lease to the Lehigh Valley

Railroad Company the tonnage steadily declined, as shown in the following table:[a]

Year.	Tonnage.	Year.	Tonnage.
1872	685,191	1875	451,045
1873	634,710	1876	399,613
1874	491,816		

The tonnage of 1876 was but little more than half that of 1872. In 1880 the tonnage was 503,486; in 1885, 364,554; in 1890, 394,432; and in 1895, 270,931.[b]

From 1897 to 1906, inclusive, the tonnage carried annually was as follows:

Year.	Tonnage.	Year.	Tonnage.
1897	231,870	1902	27,392
1898	191,287	1903	76,165
1899	173,555	1904	84,380
1900	125,829	1905	75,631
1901	122,786	1906	88,773

The decrease in 1902 was doubtless an effect of the strike of the anthracite coal miners.

In 1904 the company operated 50 canal boats towed by mules, and 52 boats in 1905. No other agencies are owned or operated on the canal.

Comparison of rail and canal service.—The Central Railroad of New Jersey, the Delaware, Lackawanna and Western Railroad, and the Lehigh Valley Railroad, all double tracked, appear to compete directly with the Morris Canal. These roads were estimated in the Report of the Commissioners of 1903[c] to have a carrying capacity of at least ten times that of the canal, and it was pointed out that—

> the railroads operate constantly, while the canal can be operated only seven or eight months in the year. The railroads which compete with the canal all run from its western terminus at Phillipsburg to the easterly terminus at the Hudson River, and all are from 20 to 30 miles shorter than the canal. The time required for moving freight between these termini by rail appears to be about nine hours, while the time required by the canal is between four and five days. Allowing four or five days for discharging cargo at the Hudson River and for the return trip, it requires from eight to ten days to cover each shipment of 70 tons of coal from Phillipsburg to tidewater. Moreover, there are practically no return freights on the canal, as substantially all miscellaneous freight is carried by rail. As to the relative cost of moving freight by canal or by rail, it is stated by the canal company that the amount paid captains in freights and the expense of maintaining boats is almost equal to the amount received for transportation on the canal.

Proposed abandonment.—In 1903, under resolution of the New Jersey legislature, a commission was appointed (consisting of George T. Werts, John W. Griggs, and Foster M. Voorhees) to investigate and report upon the abandonment of the Morris Canal. The com-

[a] Report of Commissioners, 1903, pp. 30 and 31.
[b] Report of the Commissioners, 1903, pp. 30 and 31.
[c] Page 34.

missioners reported that the small size of the canal and the elevation of 914 feet from tidewater to the summit of Lake Hopatcong are great detriments to the economical operation of the canal. As the report states (p. 36)—

> it is necessary to pass the boats through a great number of locks and to actually take them out of the water and divide them in two parts, and elevate them by means of inclined planes, to overcome the grades. This method, while ingenious and unique, and in its time useful, is at present obsolete and unprofitable.

In view of these facts, the commissioners conclude that apparently the canal can not be operated either by the company itself or by its lessee or by the State without a large annual loss. The report of the commission does not take cognizance of the possibility of enlargement and improvement of the canal to meet modern requirements. The conception by the commission of the problem presented to it appears to have been confined to a recommendation as to whether navigation on the canal be abandoned, and, having decided this in the affirmative, to devise and recommend some scheme of abandonment whereby the State could—

> without incurring any State debt, insure just compensation to all parties interested and entitled thereto.[a]

Numerous protests were sent to the commissioners of 1903 against the abandonment of the canal. One petitioner wrote as follows:

> We, all of us here, are opposed to the abandonment of the canal for the reason that we would be entirely at the mercy of the Delaware and Lackawanna Railroad Company. We were compelled last winter to cart our Lehigh coal from the Lehigh and Hudson Railroad, about 4 miles. The Lackawanna people refused to bring coal from Easton for us. We had to use their soft coal at their price or go without. If the canal is abandoned we will be in a terrible situation. I have been in business here for the last forty years. My business was good until 1871, when the Lehigh took possession. Then there were over 600 boats in good running order; now there are less than 60. It looks as if they got the canal for the purpose of abandoning it as soon as they could do what they have been trying to do for the last fifteen years. They can't supply 10 per cent of the demand there is for coal along the line of the canal with the boats they have. I don't see what they have in mind. The canal could be made to pay good if they give it a chance. There certainly might be more demand for coal now than there was in 1871.

Another petitioner says:

> The Lehigh Valley Railroad Company now argues as a reason for the canal's abandonment that it is not a paying institution. The first thing that suggests itself in reply to that suggestion is to ask in reply, "Then, why do you not abandon it unconditionally, and let the valuable right you got from the State to induce you to maintain it, return to the State?" All that the canal owners can ask of the State is that they shall not be compelled to operate this losing venture. There is nothing in this position of a nonpaying investment which in anywise justifies the demand that the company shall be permitted to retain what it received as a price for promising to maintain the venture, win or lose. The company (railroad) procured the control of the canal for the very purpose of removing its competition. That it has fully succeeded in this object is shown in its own respectable testimony. For it says, "We should be relieved of the canal's operation, because we are not operating it at a profit, but at a loss." That was their very purpose in acquiring it—to prevent it from competing with the Lehigh Valley Railroad.

A third petitioner asserts the belief that it is susceptible of legal proof that by the nonuse of the canal the rights and franchise of the canal company and its lessee have reverted to the original owners and to the State, and also that the attempt to abandon the canal is

[a] Report of the commissioners of 1903, p. 41.

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CANALS IN PENNSYLVANIA

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the Lehigh River. To raise money to effect the contemplated improvements, the three grantees just named executed a deed, dated August 10, 1818, conveying under certain conditions to trustees for the use of certain persons furnishing said money, and associated under the name of the "Lehigh Navigation Company," all the rights vested in them by the above-mentioned act, reserving to themselves certain residuary profits and exclusive privileges in the management of the company. Meanwhile, White, Hanto, and Hazard had purchased certain interests in coal lands situated near Lehigh, and in order to raise funds to work their mines, executed a second deed, dated October 21, 1818, by which they conveyed such lands to trustees for the use of certain persons furnishing said funds, and associated under the name of the "Lehigh Coal Company" with similar reservations to those above noted. The latter company by deed dated April 21, 1820, united and amalgamated with the "Lehigh Navigation Company," under the name of the "Lehigh Navigation and Coal Company." The funds of the new company being still insufficient for the objects of the association, the name was changed by agreement, dated May 1, 1821, to the "Lehigh Coal and Navigation Company," which was incorporated by the legislature of the State, February 13, 1822, and is the present corporation. The maximum amount of money to be invested in land, according to the charter of 1822, could not exceed $60,000, nor could the entire capital exceed the sum of $1,000,000. In later years, however, the requirements of the corporation demanded more capital, for which privileges were granted so that in 1905 the capitalization of the company was $17,378,500, divided into shares of $50 each. There was a funded debt of $20,025,083. The capital and funds are invested in coal lands, the canals owned and leased by the company, railroads and other property.

Relations with other carriers.—According to Moody's Manual, all the roads owned and controlled by the Lehigh Coal and Navigation Company are leased to the New Jersey Central Railroad, at a rental of one-third of the gross earnings.

Traffic.—The freight passing through this canal is composed largely of coal, stone, sand, groceries, lumber, brick, and pig iron.

The traffic for the two years 1899 and 1905 was as follows:

	Tons.
1899	389,244
1905	190,752

The articles of merchandise shipped over the canal in 1899 and 1905 were distributed as follows:

Article.	1899.	1905.
	Tons.	*Tons.*
Class 1. Coal, stone, sand	364,508.10	171,998.1616
Class 2. Manure, hay, straw, lumber, and cordwood	7,378.18	4,052.1575
Class 3. Groceries, lime, cement, pig iron, brick	17,356.19	.....
Class 3. Groceries, iron, brick, ice	.....	14,700.117
Total	389,244.7	190,752.1654

Vessels employed on canal.—The company itself does not own any *teams.* It hires its boats to boatmen who pay a rental therefor and

[illegible]

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The length of locks varies from 90 to 100 feet and the width from 11 to 22 feet. The period of navigation is nine months. The cost of the canal and fixtures, according to the report of the Delaware Division Canal Company for 1905, made to the Pennsylvania Department of Internal Affairs, is estimated at $2,433,350.

History.—This canal was constructed by the State of Pennsylvania, and originally formed part of the extensive system of public works inaugurated by that State under the act of March 27, 1824, to offset the results promised by the Erie Canal then in course of construction by the State of New York. It was completed in 1830. The Delaware division of the Pennsylvania Canal was operated as an independent section of the public works until the passage of the act of the legislature, entitled "An Act for the sale of the State canals," approved April 21, 1858. This measure directed the governor of the State within thirty days after the passage of the act to sell and deliver to the Sunbury and Erie Railroad Company all the public works of the Commonwealth then remaining unsold, according to certain terms set forth in said act. In pursuance of the powers so conferred, William F. Packer, then governor, by three separate deeds, on May 19, 1858, conveyed to the Sunbury and Erie Railroad Company the canal lines of the State then remaining unsold, consisting of the Delaware division, the lower North Branch division, the upper North Branch division, the West Branch division and the Susquehanna division; the consideration being $3,500,000.[a]

The act of the legislature authorizing the sale of the public works empowered the Sunbury and Erie Railroad Company to dispose of the canal lines, with the proviso that, in case the canals were sold for more than the price paid to the State, 75 per cent of the excess should be paid into the treasury of the Commonwealth. Under authority of said act the Sunbury and Erie Railroad Company, on July 10, 1858, sold to an association known as the Delaware Division Canal Company of Pennsylvania the Delaware division of the Pennsylvania Canal. The railroad, aforesaid, also disposed of its other canal lines, the total amount realized being $3,875,000, of which amount $281,500 (75 per cent of the excess over purchase price) was paid into the treasury of the State as agreed upon.

On July 14, 1858, the governor of Pennsylvania issued letters patent, creating the corporation known as the Delaware Division Canal Company of Pennsylvania. Three years later the legislature provided that the Delaware Division Canal Company of Pennsylvania should pay the same taxes as were assessed on the capital stock of all companies incorporated by or under the laws of the Commonwealth. Under the letters patent of 1858 the number of subscribers was 13 and the number of shares subscribed for 24,000. This company continued to operate the canal until August, 1866, when its property was leased to the Lehigh Coal and Navigation Company for ninety-nine years at a stipulated rental.

Financial.—According to the report of the Delaware Division Canal Company to the auditor-general of Pennsylvania for 1905, the authorized capital stock of the company is $2,400,000, divided into 48,000 shares of the par value of $50 each. Of this authorized capi-

[a] Klein, Canals of Pennsylvania, pages 25 and 26.

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[illegible]

[illegible]

to take tolls at the rate of 12½ cents at each lock below Reading, and 8 cents above that borough on every ton of the ascertained burden of vessels. Dams were to be

> so constructed that at least 30 feet in width in the main channel should be 12 inches lower than any other part of such dam, so as to contract the water passing the river within that space. * * * The dams shall be at least 15 feet in width, so as to admit a safe passage for wagons and other carriages over the same.

The locks were to be at least 20 feet wide and 120 feet long, and

> at all dams where there is not made a slope convenient for the passage of rafts of timber, boards or scantling

such rafts, unless carrying merchandise, were to pass the locks free from toll.

By supplementary act, passed in 1816, this company was authorized to commence improvements at any point on the river, but money was not to be diverted from one section of the river to another. The waterway was opened from Philadelphia to Mount Carbon in 1825. A large and lucrative business was carried on the Schuylkill Navigation until the completion of the Reading Railroad into the coal regions in 1842. In 1845, the company was empowered to build and own boats and to rent or sell them, and to own cars to transport freight by rail to and from the river. The company was not to engage in transportation. In the same year the legislature authorized the navigation company to appoint agents at any place in the United States for transfer of the company's stock. This act expressly provided that no loan of money or contracts made by any person with the company for the purpose of enlarging their works should be deemed to be usurious by reason of a higher rate of interest than 6 per cent on such loans. Beginning in 1846 extensive improvements were carried out; but this expense, and the damage caused by the flood of 1850, forced the company into bankruptcy and led to a reorganization in 1852. In 1859 the company was empowered by the legislature to contract for—

> the transportation of anthracite coal and other articles upon their navigation and to and from points beyond the same and to include the charge for such transportation in their charge for tolls.

The water route continued to be an active competitor for the traffic until 1870, when the Philadelphia and Reading Railroad leased the Navigation for a period of 999 years.

Relations with other carriers.—According to the statement of the Schuylkill Navigation, this company operates its own works and is not leased to any railroad company. The same schedule, however, shows that the principal office of the company is the Reading Terminal, Philadelphia; that out of 65,975 shares of preferred stock, all but 106 are owned by the Reading Company (the holding company for the Reading Railroad system), and that out of 13,270 shares of common stock, the Reading Company owns 12,907 shares.

There are two important railway lines following the valley of the Schuylkill, the Pennsylvania Railroad, with its own lines and connections reaching the Eastern States, the Southern States, and the Far West, and the Reading Railway, covering all important points in southeastern Pennsylvania, the anthracite coal region, and with its own lines extending to New York.

The Schuylkill Navigation is operated as a public highway of the State. It is claimed that the navigation company has no con-

[illegible]

Traffic. — [illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

Finances.—The authorized capital stock of the company is unlimited. The schedule of the company, furnished the Bureau of Corporations, shows that there are now 79,245.24 shares of stock, 65,975 being preferred and 13,270.24 being common stock, of the par value of $50 each. This makes the amount of capital paid in $3,962,262. There have been no dividends during the past ten years. The bonded indebtedness of the company is $8,494,872.86, represented by mortgages drawing 6 and 7 per cent.

The gross earnings for 1904 were $61,533.60; expenses, maintenance and operating, for the same year, $117,257.78. Loss on operating, $55,724.18. In this year a destructive flood damaged the works of the company and caused a loss estimated at $50,000. In 1905, the gross earnings were $65,725.74; expenses, maintenance and operating, $68,722.18. Loss on operating, $2,996.44.

Tolls.—The following rates of toll on anthracite coal, per ton, in cents, are from collieries in Shamokin, Mahanoy, Schuylkill, Lorberry, and Lykens Valley district, in boats using the Schuylkill Navigation from Port Clinton:

To—	Prepared sizes.	Pea coal.	Smaller sizes.
	Cents.	*Cents.*	*Cents.*
Hamburg	77	62	62
Shoemakersville	85	70	70
Mohersville	90	75	75
Leesport	93	78	78
Reading	96	81	81
Port Union and Unionville	104	80	79
Pottstown and Parkers Landing	107	92	77
Spring City	109	90	75
Black Rock Dam	108	89	74
Philadelphia:			
Schuylkill Front	110	80	65
Manayunk	112	82	67
Falls of Schuylkill	112	82	67

The above rates include steam towing between Fairmount Locks and wharves on Schuylkill Front. They also include loading and trimming but are exclusive of the cost of unloading. If coal is shipped in leased boats, a proportion of the freight rate for boat installment is collected from the shipper with the tolls and noted on the captain's bill of lading as so much freight advanced. There are local rates on miscellaneous freight which are unimportant. The tolls allowed under the charter are prohibitory under business conditions which have prevailed for many years. The present tolls are adjusted to meet present conditions and are lower than the charter rates, and are fixed by the general manager of the company. The printed sheets are posted for the information of the public at collectors' offices and at all lock offices on the line of navigation.

Recent improvements.—The only canals connected with this navigation are those connecting the pools created by dams in the river. The navigation was enlarged in 1835 and 1836 to a 5-foot depth, and again in 1846–47 to 6½ feet, which is its present depth. During the past few years 2 new dams—No. 18 and No. 31—have been rebuilt, replacing old structures, and one dam—No. 22—has been partially rebuilt and strengthened. A permanent concrete superstructure has been built for the cut stone aqueduct crossing Allegheny Creek. Dam No. 25 and the connecting canal and the mechani-

[illegible]

CANALS IN DELAWARE AND MARYLAND

[illegible]

The original cost, according to the Agnus Commission of 1906, was $2,250,000, of which one-fifth was paid by Congress, $100,000 by the State of Pennsylvania, $50,000 by the State of Maryland, $25,000 by the State of Delaware, the remainder being contributed by the citizens of the three States.

The canal is usually open nearly the whole year, and not only shortens the distance between Baltimore and Philadelphia, but forms an important link in the system of inland waterways between the North and the South.

History.—The Chesapeake and Delaware Canal Company, the owner of this waterway, was incorporated under the laws of Maryland December 7, 1799, and under the laws of Delaware and Pennsylvania January 29, 1801, and February 19, 1801, respectively. The original authorized capital stock was $500,000. The State of Maryland in 1812 subscribed for $50,000 of the capital stock, at a par value of $200 per share. (Value of shares reduced in 1867 to $50 per share.) The number of shares now held by the State of Maryland is 1,625. The United States Government subscribed $450,000 to the enterprise, which has been increased by stock dividends to 14,625 shares. The present amount of stock outstanding is $1,903,238.50, all of which is common. The bonded indebtedness of the company is $2,602,950, drawing 4 per cent interest. No dividends have been declared since 1876.

Financial.—According to the statement of the canal managers, furnished the Bureau of Corporations, the net and gross earnings of the company for 1904 and 1905 were as follows:

	1904.	1905.
Revenue earned	$154,319.93	$168,032.43
Expenses paid	53,543.42	62,533.92
Net revenue	100,776.51	105,498.51

Tolls.—According to the toll sheet of the company tolls are charged on weight. The weight includes that of the package and its contents. The packages are required to have their weight marked thereon. In the absence of such marks the collector of tolls is authorized under the rules of the company to take such packages as "Not enumerated and unknown" and charge accordingly. The rates of toll are specified with great minuteness in 12 pages of the toll sheet, and there are special rates of toll on vessels to and from Norfolk, York River, and points south.

The following statement shows the rates on some of the more important freight passing through the canal:

Agricultural productions, not enumerated (per bushel, 2 cents), per 1,000 pounds		$0.35
Agricultural implements, not otherwise mentioned	per 1,000 pounds	.40
Apples (per barrel, 3 cents)	per ton	.30
Articles of merchandise, not enumerated and unknown, in boxes or bales	per cubic foot	.02
	per keg	.04
	per one-half barrel	.06
	per barrel	.10
	per tierce	.30
	per hogshead or crate	.50
	per 112 pounds	.10
Bacon, beef, and pork (per barrel, 8 cents)	per 1,000 pounds	.20

Boats, empty, steamers, vessels, and barges:		
Under 40 tons register tonnage	each	$5.00
40 tons and under 80 tons tonnage	do	1.00
80 tons and under 250 tons tonnage	do	4.00
250 tons and over tonnage	do	10.00
Brooms:		
Common	per ton	50
Fine	do	50
Cars:		
Box cars	each	1.00
Small dump cars	do	1.00
Platform cars	do	1.00
Coal	per 2,240 pounds	50
Cotton yarn	per 1,000 pounds	50
Fertilizers, guano, tankage, manures, potash, and other chemicals for fertilizers	per 1,000 pounds	50
Flour and corn meal, per barrel 4 cents	per ton	40
Grain:		
Wheat	per bushel	10
Rye, corn, barley, and malt	do	10
Oats	do	0.75
Ice	per ton	50
Iron:		
Pig, bloom, bar, or scrap	do	50
Castings of all kinds, except stoves and pipes	per 1,000 pounds	50
Lumber, timber, planks, and scantling, in vessels and boats, water measure	per M feet	50
Machinery	per 1,000 pounds	50
Naval stores, rosin, turpentine, pitch, tar, turpentine, per barrel 4 cents	do	40
Oil, petroleum, or coal oil, per barrel 4 cents:		
In bulk	per 1,000 pounds	50
In 40-pound cases	each	0.50
All other kinds	per barrel	40
Salt, per bushel 2 cent, sack 4 cents	per 1,000 pounds	50
Sewing machines	each	40
Shingles:		
Cedar, more 2 feet	per M	50
Cedar 2 feet and under	do	50
Pine and cypress, more 2 feet	do	50
Pine and cypress, 2 feet and under	do	50
Staves	per M	50
Sugar	per 1,000 pounds	50
Tar, Naval Stores	per ton	50
Tobacco	10 hogsheads	40
Timber:		
Lead	per 1,000 pounds	50
Manufactured	do	50
Vegetables	per 100	50
Wool	per 1,000 pounds	40

A rule of the company requires that—

All loaded vessels must present bill of lading or pay bill of tolls as estimated by company's collector. Duplicate certificates of the total cargo or discharged must be returned to collector for adjustment of tolls.

Vessels that do not pass through the entire canal pay as follows:

For passing from any point in upper level to another point in the same level, quarter mile.

From any point in the upper level to the lower level, half mile.

From the upper level to either side cross-cut, three-fourths mile.

For passing from point in the upper level, full mile is to be charged.

From the Delaware River to any point south of the cross-cut, quarter mile.

To or through below the lock, half mile.

A regulation of the company requires that tolls shall be paid at the first lock passed by vessel, on payment of which the master receives a pass bill showing from the amount of tolls paid and the time of entering. This bill must be exhibited to the keeper of each lock before passing

the same, and must be surrendered to the collector before entering the last lock. Vessels applying for passage out of the canal and exhibiting no pass bill are required to pay full toll for the whole canal

Another regulation prescribes that for any vessels passing through the canal without paying the prescribed tolls either of the collectors is authorized by law—

To seize such vessels wherever found and sell the same at auction for ready money; which, so far as necessary, shall be applied toward paying the said tolls and all the expenses of seizure and sale and to enforce the penalties.

No vessel is allowed to carry sail on the canal, nor may any vessel of any description pass through the canal or any part of it at a rate exceeding 4½ miles an hour, except by permission of the president of the board of directors.

No vessels are allowed to use steam on the canal, except by permit issued from the office of the company, which reserves the right at any time to withdraw the privilege of so using steam.

Towage.—The rates of towage for sailing vessels and barges through the canal, including all lock towing, according to the sheet of the Canal and Back Creek Towing Company, are as follows:

TABLE 90—*Rates of towage, Chesapeake and Delaware Canal*

Sailing Vessels.	Loaded.	Light.
Under 20 tons, custom-house register	$3.50	$3.50
20 tons and under 30 tons	3.75	3.75
30 tons and under 40 tons	4.00	4.00
40 tons and under 50 tons	4.25	4.25
50 tons and under 60 tons	6.50	4.50
60 tons and under 70 tons	6.75	4.75
70 tons and under 80 tons	7.00	5.00
80 tons and under 90 tons	7.25	5.25
90 tons and under 100 tons	7.50	5.50
100 tons and under 110 tons	7.75	5.75
110 tons and under 120 tons	8.00	6.00
120 tons and under 130 tons	8.25	6.25
130 tons and under 140 tons	8.75	6.75
140 tons and under 150 tons	9.25	7.25
150 tons and under 160 tons	9.75	7.75
160 tons and under 170 tons	10.25	8.25
170 tons and under 180 tons	10.75	8.75
180 tons and under 190 tons	11.25	9.25
190 tons and under 200 tons	11.75	9.75
200 tons and upward	12.25	10.25

Barges.	Loaded.	Light.
Under 250 tons	$9.00	$6.00
250 tons and under 275 tons	10.00	7.00
275 tons and under 300 tons	10.50	7.50
300 tons and under 325 tons	11.00	8.00
325 tons and under 350 tons	11.50	8.50
350 tons and under 375 tons	12.00	9.00
375 tons and under 400 tons	12.50	9.50
400 tons and under 425 tons	13.00	10.00
425 tons and under 450 tons	13.50	10.50
450 tons and under 475 tons	14.00	11.00
475 tons and under 500 tons	14.50	11.50
500 tons and under 525 tons	15.50	12.50
525 tons and under 550 tons	16.00	13.00
550 tons and under 575 tons	16.50	13.50
575 tons and under 600 tons	17.00	14.00
600 tons and under 625 tons	17.50	14.50
625 tons and under 650 tons	18.00	15.00
650 tons and under 675 tons	18.50	15.50
675 tons and under 700 tons	19.00	16.00
700 tons and under 725 tons	19.50	16.50
725 tons and under 750 tons	20.00	17.00
750 tons and under 775 tons	20.50	17.50
775 tons and under 800 tons	21.00	18.00
800 tons and under 825 tons	21.50	18.50

Towage to be paid at collector's office from which the vessel takes tug.

Traffic.—The freight passing through this canal is composed largely of coal, lumber, fertilizers, pig iron, and miscellaneous articles. The annual tonnage for ten years has been as follows:

	Net tons.		Net tons.
1896	675,226	1901	667,808
1897	726,582	1902	623,200
1898	752,537	1903	704,147
1899	617,798	1904	706,226
1900	639,548	1905	701,955

This was distributed as follows:

	1904.	1905.
	Net tons.	*Net tons.*
Eastward	490,607	455,081
Westward	215,619	246,874
Total	706,226	701,955

The articles shipped over the canal in 1904 and 1905 were as follows:

TABLE 91—*Traffic of Chesapeake and Delaware Canal, 1904–1905*

Articles.	Tonnage.	
	1904.	1905.
	Net tons.	*Net tons.*
Lumber, eastward	267,439	235,311
Coal, westward	105,774	111,158
Miscellaneous articles:		
Eastward	44,627	75,257
Westward	76,505	105,996
Wood, eastward	65,579	64,926
Shells and sand:		
Eastward	35,830	22,198
Westward	15,968	17,384
Railroad sills, eastward	52,790	31,270
Iron, pig, eastward	24,342	26,119
Fertilizers, westward	17,372	12,336

The canal company itself is not engaged in transportation and, according to the statement of the managers, is not leased to any railroad. Railroads do not prorate with the canal company. Various navigation agencies operate on the canal, the most important being the Baltimore and Philadelphia Steamboat Company (Ericsson Line), said to enjoy special privileges from the canal company; and the Back Creek Towing Company, which appears to have had a practical monoply of towing barges through the canal except those belonging to the owners of tugs.

Vessels employed on the canal.—Approximately 950 vessels operating on the canal in 1904 and 1905 made the following number of trips:

Class.	Number of trips.	
	1904.	1905.
Towing	2,553	2,866
Steam	1,513	1,930
Rafts of piling	132	222
Total	4,198	5,018

Tolls on passenger traffic.—It appears that the canal company, supposing it had the right to charge toll on passengers, commenced doing so on the opening of the canal in 1829 when the Citizens' Line between Philadelphia and Baltimore began to carry passengers through the canal, for which they paid toll to the canal company until 1831. In 1830 the Union Line from New Castle put on a line of passenger barges, paying the canal company compensation for the passengers using the canal. This toll charge on passenger traffic appears to have continued until 1844, when the authority was contested. On February 23, 1844, the Baltimore and Philadelphia Steamboat Company, popularly known as the Ericsson Line, was chartered by the Maryland legislature, and from the time of its incorporation to the present day has operated its boats, carrying both freight and passengers through the canal. This line runs two boats daily. The efforts of the canal company to secure amendments to its charter by which the toll on passengers may be renewed has been resisted by the Ericsson Line. A long controversy has existed between the managers of the canal company and the officers of the Baltimore and Philadelphia Steamboat Company (Ericsson Line).

CHESAPEAKE AND OHIO CANAL

Description.—The Chesapeake and Ohio Canal is a private canal. It extends along the Potomac River on the Maryland side from Cumberland, Md., to Washington, D. C., at which point there is a tide lock connecting with the Potomac River. It is a towpath canal, mules being used as motive power. Its length is 185 miles, which includes four miles of slack-water navigation. The period of navigation is eight to nine months—from March to December. The total cost of construction to May 2, 1907, as reported by the trustees, was $11,620,337.35. The chief commodity carried is bituminous coal from mines above Cumberland.

The canal varies in width at the surface from 55 to 65 feet, and from 30 to 42 feet at the bottom, and is constructed for a depth of 6 feet throughout. The ascent of 609.7 feet is overcome by 78 locks, with an average lift of a little over 8 feet, and a tide lock that connects Rock Creek basin with the Potomac River. The locks are 100 feet long and 15 feet wide in the clear.

Control.—The affairs of the canal are managed by two trustees—H. L. Bond, jr., of Baltimore, Md., general attorney for the Baltimore and Ohio Railroad Company, and Joseph L. Bryan, of Richmond, Va., trustees for the bondholders of the issue of 1844, the interest of the bondholders of the issue of 1878 (referred to below) having been purchased by the bondholders of 1844, the latter being subrogated to the rights of the former.[a] The entire bond issue of 1878, amounting to $500,000, was held by the Baltimore and Ohio Railroad on June 30, 1906.[b] At that date the Baltimore and Ohio Railroad also held $861,000 of the bond issue of 1844 and $5,800 of the stock of the Chesapeake and Ohio Canal Transportation Company. Regarding the bond issue of 1878, the entire amount of which is, as stated above,

[a] State of Maryland *v.* Brown, 74 Md., 484 (1890).
[b] Moody's Manual, 1907, p. 296.

owned by the Baltimore and Ohio Railroad, the following statement appears in the Sixty-first Annual Report of the President of the Chesapeake and Ohio Canal Company to the stockholders, dated January 10, 1889:

> By the terms of the act authorizing the issue of these bonds, the holder or holders of a majority of said bonds are authorized to foreclose the mortgage whenever three successive coupons shall be in default. Up to this time the holders have not taken action, but as a majority of these bonds are held by the Baltimore and Ohio Railroad Company, we do not anticipate that any action will be taken in the near future.

At that date four interest coupons were due and unpaid. The report continues:

> If the bondholders of 1878 were to enforce their lien, the State would probably be powerless to protect its interest.

In respect to the interest of railroads in the stock of the canal company, the interest of the State of Maryland in the canal property was sold to F. S. Landstreet, a director of the Western Maryland Railroad Company, who was said to be disposed to cooperate with the present management of the canal. It is thought that this stock may eventually be turned over to the canal company or its creditors as a part of the consideration for obtaining a right of way for the railroad over the canal property. In August, 1907, Mr. Landstreet transferred his interest in the canal to the Continental Trust Company of Maryland.

For a statement of the interest held by the United States and others, including that formerly held by the State of Maryland, see below, page 283.

Operating expenses.—The canal is under its charter rather a public highway than a transportation concern, and is not in any sense a common carrier. The canal company proper owns no boats nor barges. It has the right to manage the canal and to regulate the vessels navigating it, and to prescribe charges for such navigation.

According to the schedule of the Chesapeake and Ohio Canal Company received by the Bureau of Corporations, railroads do not procure with the canal company, nor with any of the transportation agencies operating on the canal, although efforts have been made to get the Western Maryland Railroad to procure. There are about 120 canal boats operating on the canal, of which 112 are owned by the Consolidation Coal Company of Baltimore, Md., a Maryland corporation. The capital stock of this company authorized and issued amounts to $10,250,000, of which until May, 1906, the Baltimore and Ohio Railroad owned $5,255,200, a majority.[1] The canal boats owned by the Consolidation Coal Company are operated by the Canal Towage Company of Washington, D. C., a West Virginia corporation, capitalized for $5,000, the entire issue being owned by the Consolidation Coal Company, to which the Canal Towage Company pays tripping calculated on the number of tons carried. These boats carry about 115 tons each. The dividends of the Canal Towage Company were 50 per cent in 1904, 150 per cent in 1905, and 50 per cent in 1906. The gross earnings of this company in 1905 were $141,246.73; operating expenses, $134,[illegible]; and the net earnings, $[illegible].

Some 20 boats are operated on the canal by individuals. One steam freight boat also runs on the canal.

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[1] Moody's Manual, 1907, p. [illegible]

Tolls.—The toll on everything except coal is based on mileage.

First class—1 cent per ton per mile for the first 20 miles and one-half cent per ton per mile for each mile in addition to the first 20. Second class—1 cent per ton per mile for the first 20 miles and one-fourth cent for each mile in addition to the first 20.

Tolls on coal are adjusted in proportion to the delivery rate from the mine. Rates for the season of 1906 were as follows:

	Cents.
Washington, coastwise	10
River forts	20
Alexandria	25
Local consumption in Washington, depending on point of delivery	25 to 50
Williamsport, depending on point of delivery by Western Maryland and Cumberland Valley railroads, reshipment from Williamsport	5 to 25

The rate on coal for intermediate deliveries along the line varies from 25 to 50 cents.

Traffic.—Motive power is furnished by mules. The Canal Towage Company appears to own its animals. This company usually carries for all who offer, but it is not a common carrier, and its rates are therefore in the nature of contractual agreements. Practically its entire business is the transportation of bituminous coal from Cumberland, Md., to Washington, D. C. Some little coal is carried to intermediate points, and some small quantities of other commodities as return cargoes. Other commodities passing through the canal are farm products, general merchandise, etc. Freight rates on coal, including canal tolls from Cumberland are:

To Hancock and Williamsport	$0.70
To Sharpsburg and Shepherdstown	.90
To Antietam	1.00
To Harpers Ferry	1.05
To Brunswick and Point of Rocks	1.18
To Point of Rocks and Washington	1.35

Coal tonnage passing through the canal amounted to 206,629 tons in 1904, 174,920 tons in 1905, and 197,768 tons in 1906, carried by the Canal Towage Company.

The total tonnage carried through the canal annually during the past ten years was as follows:

	Tons.		Tons.
1897	311,004	1902	233,345
1898	320,145	1903	278,945
1899	296,100	1904	287,705
1900	244,108	1905	219,867
1901	284,857	1906	225,142

From a comparison of the above figures, it appears that the bulk of the business on the canal is carried on by the Canal Towage Company. At Washington the coal is transshipped to barges of the Consolidation Coal Company and cleared for various Atlantic ports of the United States.

Financial.—The gross earnings, expenses, and deficits of the canal company for 1904 and 1905 were as follows:

	1904.	1905.
Gross earnings	$93,618.89	$87,435.95
Expenses	117,181.89	104,208.92
Deficit	23,563.00	16,772.97

No authentic statistics regarding the operations of the company prior to the time when the present trustees took charge are available.

The outstanding capital is:

Preferred stock, amount issued	$4,375,000.00
Common stock, amount issued	3,898,124.44
Bonds and other indebtedness	4,199,500.00
Total	12,472,624.44

History.—This waterway was inspired by George Washington, and had its origin in the formation of the Potomac Company, of which he was president. As the result of a conference held December 20, 1784, between delegates from Maryland and Virginia, these two States passed laws authorizing the formation of a company for the improvement of the Potomac River, and each State aided the enterprise by subscribing to the stock of the company. So long as General Washington remained the head of the company work was vigorously prosecuted, but the project languished from the time of his resignation in 1789 to become President of the United States. Shortly afterwards work was practically abandoned, although a very considerable portion of the work of building a canal around certain falls in the river had been completed. Commissioners were appointed in 1822 to examine the affairs of the Potomac Company, and upon an adverse report by them to the legislatures of the States of Maryland and Virginia, the company, in 1823, signified its willingness to surrender its charter to a new company. The project of a canal was approved by the commissioners, and as the result of a meeting of 200 delegates from Virginia, Maryland, Pennsylvania, and the District of Columbia at Washington in 1823, the Chesapeake and Ohio Canal was incorporated in 1825 by a series of legislative acts by which an agreement was reached between the States of Virginia, Maryland, and Pennsylvania and the United States. The capital stock was to consist of $6,000,000, divided into 60,000 shares of $100 each.[a] The commercial advantage of the canal to the cities of Alexandria and Washington as opposed to the city of Baltimore aroused the bitterest political agitation and hostility in the State of Maryland. Baltimore considered that her financial and commercial supremacy would be much impaired by the construction of the canal, and to meet this competition for the control of the western trade, which up to that time had been largely transported over the turnpike roads leading to Baltimore, the project of the Baltimore and Ohio Railroad was conceived. These two enterprises—the Chesapeake and Ohio Canal and the Baltimore and Ohio Railroad—began their career at the same time. The ceremonies attending the commencement of each were held on the same day—July 4, 1828—in Washington and Baltimore, respectively.

At this time the capital stock subscribed to the canal was as follows:

	Shares.	Value.		Shares.	Value.
United States	10,000	$1,000,000	Shepherdstown	20	$2,000
Washington City	10,000	1,000,000	Individuals	6,074	607,400
Maryland	5,000	500,000			
Alexandria	2,500	250,000	Total	36,094	3,609,400
Georgetown	2,500	250,000			

[a] *Tenth Census of the United States*, Vol. IV, Canals, p. 16.

The railroad stock was largely oversubscribed by individuals. Afterwards attempts were made to secure aid for the railroad from the United States, but they were opposed by the canal influences and were unsuccessful. These two enterprises fought each other bitterly, and their history is a struggle for supremacy. The difficulty of procuring funds to carry on the work delayed operations in both companies.

The United States would make no further contributions to the canal. In 1834, the State of Maryland loaned the canal $2,000,000; and in the next few years made further stock subscriptions aggregating $4,500,000; and for this aid received a mortgage on the property, tolls, and revenues of the canal. When this had all been expended the canal had not been completed. The State refused to make further appropriations or loans, but in 1844, to assist the company in raising money from outside sources, the State authorized the company to issue bonds to the amount of $1,700,000, and waived the liens of the State upon the tolls and revenues of the canal, the entire net tolls and revenues being pledged for the payment of the interest and to provide a sinking fund for the redemption of the bonds at their maturity. The company was authorized to execute any mortgage necessary to give the fullest effect to the provision of this act.[a] With the money secured from this source the canal was finally completed in 1851.

Prior to the year 1870 no statistics of traffic on the canal are available. Under the management of James C. Clarke, who was president of the company for 1870 and 1871, the business of the canal was brought to a highly profitable condition, and at the time of his retirement in 1872 nearly the entire output of the Cumberland coal mines was carried over the canal, but under subsequent management this tonnage was allowed to pass to the railroads, first to the Baltimore and Ohio and later to the Pennsylvania. About 1872 a number of coal companies had consolidated for the purpose of building a short railroad from the mines to Cumberland, with a view to facilitating deliveries to the canal, but owing to certain influences this railroad was never allowed to connect with the canal, the benefit of this improvement thus being secured by the railroads. This short railroad was called the Cumberland and Georges Creek, and is now owned by the Western Maryland. The coal mines at Cumberland are tapped by this road and by one other called the Cumberland and Pennsylvania Railroad, controlled by the Consolidation Coal Company.

In 1878 it became necessary for the State of Maryland to extend further aid to the canal company in consequence of a freshet that had caused serious damage in 1877. This aid was given by authorizing the company to issue preferred bonds to the amount of $500,000, with a further waiver of the State's liens. These bonds were secured by a mortgage of the tolls and revenues of the canal and also of its property and franchises.[a]

In 1889 a severe freshet caused a suspension of all business along the entire line of the canal, and in this condition of affairs a bill in equity was filed in the circuit court for Washington County, Md., by the trustees acting under the mortgage executed in pursuance of the act of 1844, and shortly afterwards a similar bill was filed by the

[a] Maryland *v.* Brown, 73 Md., 484 (1890).

trustees to which the mortgage of 1875 was executed. These bills charged that the canal was in a broken and waste condition, that the company was in a bankrupt insolvent condition, and that in fact to all intents and purposes abandoned the canal with no prospect of being able to resume operations. The company admitted the insolvency, but resisted the appointment of a receiver as prayed in the bills, as did also the State of Maryland, which had been made a party defendant. The State insisted on an immediate sale of said work prematurely. Receivers were appointed by the court to examine the condition of the canal, to estimate the probable cost of putting it in good condition, and to report whether it was feasible to operate it when repaired. On their report it was decided by the court that it was impracticable to repair the canal through the agency of receivers, and that the complainants were entitled to the sale of the property and franchises of the canal free of all liens and encumbrances. Before this decree was signed a petition was filed by the trustees of the bond issue of 1844 asking that they be allowed to redeem the bond issue of 1875 and be substituted to the rights of the holders of those bonds, and that they be put in possession of the canal with the right and power to repair and operate it. The trustees of the bond issue of 1875 assented to this, but the State resisted the granting of the petition. The petition was granted however, on appeal from the circuit court.[1] The affairs of the canal are now managed by a board of trustees appointed by the court in the interest of the bondholders of 1844. As already stated, the Baltimore and Ohio Railroad Company, on June 30, 1900, held the entire bond issue of 1875 and $[illegible] of the issue of 1844. At that time the former interest held by the State of Maryland was owned by Mr. F. S. Lauderman, a director of the Western Maryland Railroad, but in August 1907, this interest was transferred to the Continental Trust Company of Maryland.[2]

The following is a summary of the aggregate investments by the State of Maryland in the Chesapeake and Ohio Canal.

	Principal	Interest	Total
First-class mortgage bonds and interest in arrears	$[illegible]	$[illegible]	$[illegible]
Second-class preferred stock and dividends in arrears	[illegible]	[illegible]	[illegible]
Third-class common stock	[illegible]	.....	[illegible]
Fourth-class common stock	[illegible]	.....	[illegible]
Total	[illegible]	[illegible]	[illegible]

According to the schedule submitted to the Bureau of Corporations by the trustees the State of Maryland has aided the canal to the extent of $[illegible] and the United States to the extent of $[illegible].

The cost of construction in 1850, the year in which the canal was completed, was $[illegible]; the cost including improvements reported to the Bureau of Corporations by the trustees in May, 1907, was $[illegible], while the Census Report on Transportation by Water in 1908 shows the cost as $[illegible].

[1] Maryland v. Brown, [illegible] Md. [illegible] (1907).
[2] See note p. [illegible]

The Chesapeake and Ohio Canal connects with the Potomac River through Rock Creek in Georgetown. The Government has expended considerable money on the improvement of the Potomac, which is navigable to Little Falls, 3½ miles above Georgetown. The Aqueduct Bridge, however, which crosses the river at Georgetown, 113 miles above the mouth of the river, has no draw, and prevents the navigation of large steamers and masted vessels.

CANALS IN VIRGINIA AND NORTH CAROLINA

Private canal corporations doing business in Virginia are required to make annual reports to the corporation commissioner of that State. In North Carolina, canals have attracted very little attention from the State for many years, and there has been very little, if any, legislation on the subject. As transportation companies they are brought within the jurisdiction and supervision of the North Carolina corporation commission, to which they make only an annual financial statement.

The only canals of any considerable importance in Virginia or North Carolina are the Dismal Swamp Canal and the Albemarle and Chesapeake Canal. Both these canals connect the waters of Chesapeake Bay with those of Albemarle Sound. Traffic on the Albemarle and Chesapeake and on the Dismal Swamp Canal is substantially the same in character. The two canals serve practically the same territory. Shippers and consignees have little preference for one of these routes over the other, since contracts of carriage are made by the brokers, and shippers have no interest in the particular route the goods take. These canals furnish means of transporting products at an average cost considerably less than the cost of rail transportation.

ALBEMARLE AND CHESAPEAKE CANAL

Description.—The Albemarle and Chesapeake Canal forms a link in the inland water route from Norfolk to Albemarle Sound via Currituck Sound. The canal proper is about 11 miles in length, and consists of two distinct sections: the Virginia cut (8½ miles) from the southern branch of Elizabeth River to North Landing River; and the North Carolina cut (2½ miles) from Coanjock Bay, in Currituck Sound, to North River. The surface width of the canal is 80 feet and the average depth of water 9 feet. There is one lock, the dimensions being 220 feet long by 40 feet wide. The original canal was completed between 1855 and 1860, and it was enlarged between 1890 and 1903. The estimated cost of construction to 1907 is placed at $1,151,849.18. The canal is open the year round. It is a ship canal, the motive power employed being steam and "power" boats.

History.—The canal is owned by the Albemarle and Chesapeake Canal Company, which was incorporated under the laws of Virginia, March 15, 1850, as the Great Bridge Canal Company, and reincorporated under the name of the Great Bridge Lumber and Canal Company March 2, 1854. On February 8, 1855, the legislature of North Carolina, after reciting the Virginia act of incorporation, passed a special act incorporating the same company under the same name, with a proviso that its name might be changed to that of the Albemarle and Chesapeake Canal Company, or to any other name, when-

over the company should be authorized by the legislature of Virginia to make such change, which was done by an act of the legislature of the latter State February 27, 1896.

The company was originally capitalized for $500,000, divided into shares of $100 each. Later was authorized this to be increased to $800,000, then to $900,000, and in 1887 and 1888 to $1,500,000. The present outstanding capital stock of the company is $555,300, common stock.

Relations with other canal companies.—The Albemarle and Chesapeake Canal Company owns a controlling interest in the Newbern and Beaufort Canal Company (formerly the Croatan and Harlowe Canal Company) and it is also said to own important interests in the Fairfield Canal Company, the canals of which companies are short and relatively unimportant waterways.

Operating operations.—The secretary of this canal company states:

> The company furnishes a waterway for use of any and all coming to it. It has no connection in any manner with the charges or transportation, nor can I name any party or parties who make a specialty of transporting freight through this canal.

The canal company originally owned its own tugboats and allowed no other boat to do any towing on the canal. Finding this unpractical, however, it made a contract with the Albemarle and Chesapeake Canal Towing Company to do all of the towing, thus rendering it possible that there should always be tugboats at each end in order to expedite business through the canal. In an action brought against the canal company alleging discrimination, this arrangement was defended on the ground that it insured satisfactory towing facilities to the general public for the entire year. The decree of the court enjoined the canal company from such discrimination.[1] To-day the Albemarle and Chesapeake Canal Towing Company operates two tugboats on the canal where ten years ago the company was running ten or twelve tugs. The gross earnings of the towing company in 1905 were $17,677.31, and the operating expenses were $41,[illegible].44. No dividend has been paid since 1903. Prior to that date, from 1896, the rate of dividend varied from 12 per cent in 1900 to 4 per cent in 1896 and 1899 on a capital stock of $[illegible].00.

Several miles of the canal is navigated mainly by barges. Logs for the mills are now carried largely by the railroads, probably for the reason that the streams flowing directly in navigable waters have been worked out, but before the Norfolk and Southern Railroad was built all this business came by water.

Packet lines operating on the Albemarle and Chesapeake Canal are Bennett's North Carolina Line (Bennett's Ferry Company) and the Virginia-Carolina Steamship Company of Elizabeth City, N. C. Both lines run over practically the same route. They had a rate-cutting fight for a long time, but they finally came to an agreement, the rates now being on what is considered a fair basis. The Norfolk and Southern Railroad competes with the route and refuses to make interchange arrangements with lines operating on the canal. The Norfolk and Southern Railroad also competes with the division of the Virginia-Carolina Inland Steamship Company running on the Dismal Swamp Canal. The railroad company owns the steamer *Newton* which runs on that canal for the Dismal Swamp Steam Packet Com-

[1] Greig v. Albemarle and Chesapeake Canal Co., U. S. circuit court, Norfolk, Va., 1904.

pany, which does the largest business between Elizabeth City, N. C., and Norfolk, thus giving the Norfolk and Southern Railroad a rail and water route between these two points.

Below are presented comparative statements of vessels and traffic passing through the Albemarle and Chesapeake Canal during the years ending September 30, 1905 and 1906.

TABLE 92—*Number, class, and tonnage of vessels passing through the Albemarle and Chesapeake Canal*

	North.				South.			
	1906.		1905.		1906.		1905.	
	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.	Number.	Tonnage.
Steamers	1,009	65,097	990	53,319	1,018	64,892	977	52,140
Sailing vessels	239	11,932	175	8,791	234	11,815	203	9,513
Barges and lighters	159	30,303	244	39,356	163	32,854	253	40,413
Rafts	266	.....	285	.....	.....	.....	.....	.....
Total	1,673	107,332	1,694	101,466	1,415	109,561	1,433	102,066

	1906.		1905.	
	Number.	Tonnage	Number.	Tonnage.
North	1,673	107,332	1,694	101,466
South	1,415	109,561	1,433	102,066
Total	3,088	216,893	3,127	203,532

TABLE 93—*Freight traffic on Albemarle and Chesapeake Canal*

		1906.	1905.
NORTH.			
Cotton	bales	1,230	698
Fish	barrels	1,050	28
Iron	pounds	.....	51,000
Wood	cords	18	228
Corn	bushels	45,456	40,275
Railroad ties		3,122	.....
Potatoes	barrels	25,560	27,518
Oysters	bushels	15,616	11,135
Lumber, sawed	feet	17,907,176	15,546,998
Logs	do	12,648,565	12,163,807
Shingles		5,601,000	3,337,000
Staves		2,797,000	4,248,000
Piling	linear feet	1,108,864	1,369,395
Melons		113,500	39,700
Passengers		876	771
SOUTH.			
Corn	bushels	33,168	29,500
Oyster shells	do	.....	2,000
Iron	pounds	400,000	203,000
Guano	tons	3,541	1,424
Coal	do	3,356	4,035
Salt	do	656	.....
Merchandise, not classified	pounds	9,604,000	8,350,000
Passengers		733	749
ESTIMATED AMOUNT IN TONS			
North		80,727	77,323
South		14,542	11,257
Total		95,269	88,580

Traffic.—The freight through the Albemarle and Chesapeake Canal represents all classes of merchandise and produce, the largest

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]

[illegible]

[illegible]

[illegible] — [illegible]

[illegible] — [illegible]

[illegible]

[illegible]

[illegible]

[illegible] — [illegible]

[illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

The toll sheet states that—

upon application to the office of the company at Norfolk, owners of tugboats plying regularly through the canal will be allowed half rates on tugboats with tows. This does not in any way apply to tugboats without tows.

The Albemarle and Chesapeake Canal Towing Company publishes in the toll sheet of the Albemarle and Chesapeake Canal Company the following rates for towing through the Albemarle and Chesapeake Canal. The rates are to or from the harbor of Norfolk—to or from the mouth of the North River, North Carolina—and apply to sailing vessels, barges, and other unrigged vessels.

58 tons or less:		
Loaded or partially loaded	per ton	$0.35
Light	do	.25
Over 58 and less than 100 tons:		
Loaded or partially loaded	per trip	20.00
Light	do	15.00
100 tons and over:		
Loaded or partially loaded	per ton	.20
Light	do	.15

The minimum amount of towing on any one boat or vessel shall not be less than $2.

Special rates will be given on dredges, scows, lighters, etc., based on size and destination.

Raft rates named are from Albemarle Sound to Norfolk Harbor. Not less than 100,000 feet in one raft of mill logs or lumber of any kind, per thousand feet B. M., $1. Not lessthan 12,000 linear feet of piling in one raft, per linear foot, three-fourths of a cent.

Regulation of canal.—The superintendent of the canal directs the movement of all vessels, giving northbound vessels with cargo precedence of all others. All vessels entering the canal are required to have their jib booms rigged in and their anchors stayed on deck, so as to prevent damage to the canal and to passing vessels. Centerboards must be hoisted up when under way. Tows and rafts going in the same direction are not allowed to pass each other. The following regulation applies to rafts:

Rafts of mill logs or other timber must not exceed 20 feet in width; must be properly put together and exhibit proper lights at night. Rafts of oak timber are not permitted in the canal. Masters of towboats are required to inspect rafts before taking hold of them and see that they start in good order. While towing these rafts they must promptly secure any logs about to sink by attaching them to the floating ones. Doubling up rafts in the canal will not be allowed.

The master of the towing steamer will be held responsible for the condition and management of any raft he may bring into the canal.

Piling wood, logs, or lumber on the banks of canal, except by special permission, is positively forbidden.

Relation to Government improvements.—As already pointed out, this canal is a link in the inland water route from Norfolk, Va., to Albemarle Sound, N. C., via Currituck Sound, the canal cuts being owned by a private corporation. According to the report of the Chief of Engineers, 1906, p. 246, this route originally had a good 5-foot mean low-water channel, but navigation was obstructed by snags, sunken logs, and overhanging trees. Until the act of September 19, 1890, the Government's improvements were carried on under several separate projects, upon which a total of $240,169.69 had been expended. By that act all these projects were consolidated.

The present project, adopted September 19, 1890, says the above report, provides for obtaining a channel 80 feet wide and 9 feet deep at mean low water through the whole extent of the waterway, to be improved by the United States at an estimated cost of $306,667.08,

[illegible]

[illegible]

[illegible]

The money equivalent of these shares was as follows:

United States, 800 shares, at $250	$200,000
State of Virginia, 760 shares, at $250	190,000
Individuals, 384 shares, at $250	96,000
Total	486,000

The Dismal Swamp Canal Company continued to operate the canal until it was taken possession of by the United States Army in 1862. The United States held possession through an agent of the Secretary of the Treasury until the close of the war, using it to transport troops, munitions of war, and stores. At the close of the war the works were surrendered to the company. It appears, however, that in 1867 a deed of trust was executed for all the property of the company. At a meeting of the stockholders held November 5, 1866, at which the Government was represented by proxy, the president and directors of the company were authorized to borrow such an amount of money as in their judgment was necessary to improve the canal and pay the debt of the company, not exceeding $200,000; to issue bonds to that amount bearing interest not exceeding 8 per cent per annum, and to pledge the entire works of the company for payment of said bonds. In pursuance of this authority and of the sanction subsequently obtained from the legislatures of Virginia and North Carolina, the president and directors issued 200 bonds in the name of the company of $1,000 each, payment twenty years from July 1, 1867, and executed a deed of trust of that date conveying to certain persons in trust the entire canal property of the company to secure the payment of the bonds so issued. By the terms of this deed the trustees were required, on default in the payment of the principal and interest on any part of the said bonds, on the request of any one or more of the holders thereof, to dispose of the trust property at public auction or private sale for cash or on responsible credit. By supplementary deed, executed February 10, 1869, by authority of a meeting of the directors of the company, it was made imperative upon the trustees from the proceeds of sale to pay immediately to the bondholders the principal and accrued interest of the bonds, "whether said principal be then due or yet to become due."

On July 1, 1877, the company was in default on these bonds for interest to the amount of $52,000. On April 4, 1877, a majority of the bondholders had made demand in writing upon the trustees for the sale of the property under the above-mentioned deeds of trust. A called meeting of the bondholders and trustees was held and a resolution adopted requesting the Secretary of the Treasury to make an examination of the affairs of the company, and if he should agree to recommend to Congress to appropriate a sufficient amount to put the canal in order, or by some other measure to save the interest of the United States, amounting to nearly $1,000,000, the trustees should be authorized to postpone the sale. As the United States was the owner of a large interest in the canal, to wit, 800 shares representing $200,000 at par value, appropriated by Congress in 1826 and 1829, the Secretary of the Treasury deemed it incumbent to protect the interests of the Government. He therefore instructed the Solicitor of the Treasury to make personal examination into the affairs of the company. At a subsequent meeting of the bondholders, the trustees were instructed in view of the favorable response of the Secretary of the Treasury to postpone the

[illegible]

[illegible]

Elements.—[illegible]

[illegible]

[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]

Note.—[illegible]

[illegible]

[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]
[illegible]	[illegible]

[illegible]

[illegible]

[illegible]

linear foot. Tugboats 60 feet in length or less are charged $5 each trip, and there is a graded charge up to those 125 feet in length, which pay $20 each trip. A statement in the toll sheet shows that upon application to the office of the company in Baltimore boats plying regularly through the canal are allowed half rates on tugs with tows.

The toll sheet specifies rates charged on various commodities. The canal has no classification of freight. Taken at random from the toll sheet, the toll on the following articles of merchandise is as follows:

Bricks	per 1,000	$0.40
Buggies:		
Set up	each	.75
Packed	per 100 pounds	.15
Cotton	per bale	.15
Corn	per bushel	.0075
Coal	per ton (long)	.20
Cotton ties	per bundle	.03
Fertilizers or all material for fertilizer	per ton (long)	.20
Horses and mules	each	.50
Ice	per ton (short)	.20
Lumber, sawed, of all kinds	per 1,000 feet	.45
Logs, when loaded in vessels:		
Pine or gum	per 1,000 feet B. M.	.55
Ash	do	.80
Juniper	do	.80
Cyprus	do	.80
Poplar	do	.80
Oak	do	.80
Lime	per ton (long)	.20
Oil	per barrel	.10
Oysters	per bushel	.025
Piling:		
Pine	per linear foot	.005
All other kinds	do	.0075
Peanuts	per bag	.025
Potatoes:		
Per barrel		.03
Per bushel		.01
Railroad ties, all kinds	each	.02
Rails, juniper and pine, split	per 1,000	5.00
Shingles:		
6-inch	per 1,000	.15
5-inch	do	.12
4-inch	do	.10
Staves	do	.50
Telegraph poles:		
25 feet and less	each	.10
Over 25 feet	per linear foot	.005
Watermelons	per 100	.25
Wood	per cord	.25

All articles not specified in the regular toll sheet are charged 2½ cents per 100 pounds.

Rules and regulations of the canal.—Among the rules of the company, one prohibits sailing vessels from sailing through the canal; another prohibits any vessel from passing through the canal at a rate exceeding 5 miles an hour, except by permission of the superintendent in writing. The superintendent of the canal directs the movement of all vessels. It is stated that—

for the better accommodation of vessels passing each other, recesses have been provided every alternate mile. If found advisable, the officer in charge of locks will notify vessels leaving his lock of about the recesses he will meet, the tows and vessels

coming from the opposite direction, and the vessel is now arriving at said crossing will be required to wait at that point until the expected vessel shall pass. Vessels passing through the canal shall keep to the right. When a vessel is overtaken by another going in the same direction, the slower shall give the inner track to the faster, unless within 300 yards of a lock or bridge. Steamers shall pass each other on the right, and shall give signals as required by United States laws, and shall come to a minimum speed in passing vessels.

No steamboats, except such as are engaged in the business of towing under the directions and regulations of the canal company, is permitted to use the canal for tow purposes, except by special permission of the company.

Rafts, mill logs, piles, etc., must not exceed 14 feet in width, and must be properly bound together.

Recent deepening of the canal.—The canal under its present management was opened to traffic in 1890. In that year an experimental trip was made in a tugboat, in order to show how the Government could get its barges from the coast of North Carolina to Norfolk without exposing it to the dangers of Hatteras.

Traffic.—The freight passing through this canal consists mostly of North Carolina lumber destined for Norfolk and northern ports, and fertilizers, general merchandise, coal, and cement, southbound. The report of the Chief of Engineers for 1906 shows the tonnage for 1905 as follows:

TABLE 16.—*Freight traffic in Dismal Swamp Canal, 1905.*

Articles.	Quantity.	Articles.	Quantity.
Lumber	feet B. M. 124,190,000	Corn	bushels 92,300
Log logs	feet 167,714	Oysters	bushels 108,777
Pine poles	do 189,394	Canned oysters	cases 7,182
Millings	do 2,812,461	Sand	tons 4,650
Lumber logs	cords 4,858	Coal	do 1,194
Do	feet 229,760	Salt	do 2,776
Lumber rails	1,000	Shells	bushels 2,370
Pine cogs	feet 155,070	Acorns	42,000
Cypress cogs	do 21,000	Lime	tons 400
Cypress piles	do 1,020	Cotton	bales 100
Shingles	2,200,650	Corn	bushels 71,350
Laths	45,100	Staves	9,700
Railroad ties	4,46	Plaster	tons 677½
Fertilizer	tons 28,445	Oil	barrels 10
Potatoes	bushels 4,000	Potash	tons 200
Do	barrels 2,457	Peanuts	bags 1,135
Iron	tons 704½	Tar	barrels 40
Iron rails	do 500½	Pimento roling	tons 150
Steel rails	do 31	Iron	do 70
Pitch	barrels 2,081	Telegraph poles	350
Stone	tons 250	Miscellaneous	tons 9,145
Cement	do 220		

Vessels employed in canal.—The number of vessels entering and leaving the canal in 1905 were as follows:

Class.	Number.	Average draft.	Average tonnage.
		Feet.	*Tons.*
Steamers	90	8	61
Barges	105	8	200
Schooners	110	7	40
Tugs	3	8	45
Launches	16		
Rafts	8		
Small barges	70		
Minor vessels	21		

NOTE.—Although for so short the more probable means "trips," the same vessels being counted for each trip.

Transportation agencies on canal.—Among the agencies operating on the canal are the Dismal Swamp Steam Packet Company and the Virginia-Carolina Inland Steamship Company (Le Roy Steamboat Company). The former concern hauls all kinds of freight and runs between Elizabeth City and Norfolk, touching at intermediate points. The line is said to be run in connection with the Norfolk and Southern Railroad, and in open competition with independents. The latter company is incorporated, having a capital stock of $100,000. The company operates through the Albemarle and Chesapeake and the Dismal Swamp canals and on various rivers and sounds of North Carolina.

Regarding traffic and the transportation agencies on this canal, the following statement is made by Mr. John Upshur, formerly clerk of the Virginia State Corporation Commission:

> The resources of the country through which the canal passes would not justify the maintenance of the canal without through business, timber from the Swamp tributary to the canal to a large extent having been cut out and railroads having been built through the Swamp. The railroads seem to be a means of transportation for such timber as is grown in the Swamp. The canal, however, furnishes a way to markets for large rafts and barges of timber, principally logs from North Carolina. These logs are used largely at Richmond, Va., by the cedar works, and some go to the eastern markets, Philadelphia and Baltimore. The greatest tonnage through the canal is that toward Norfolk, the boats from North Carolina returning empty for loads. The tonnage is made up chiefly of forest products. Formerly a freight boat was operated between Norfolk and Weldon, N. C., taking in Elizabeth City intermediate, but I believe this line has been bought up by the railroads.
>
> The owners of the canal, or the Canal Company, are in no sense common carriers, but furnish a highway for commerce, and their waters are open to boats of suitable draft, operated by anybody paying tolls. The Richmond Cedar Works own tugboats and barges which are used to bring logs to Richmond to be manufactured by them into wooden ware. They only carry for themselves in order to control their supplies. There are various independent transportation companies operating barges, towed by tugs, and are hired out for carriage of any freight that may offer. Small sailing vessels operate through the canal between Norfolk and points in the Albemarle and Pamlico sounds and the rivers of North Carolina.

Besides the packet lines mentioned above there are the various agencies engaged in towing rafts and barges. All the local business of towing through the canal is done by Hudson & Bros., of Norfolk, who are the towing agents of the Lake Drummond Canal Company. Hudson & Bros. occupy about the same relation to this company as exists between the Albemarle and Chesapeake Canal Towing Company and the Albemarle and Chesapeake Canal Company. A shipper at Newbern says:

> No regular schedule freight lines operate through the canal, but the ship brokers at Norfolk and other cities notify the captains and they put the boats in the place * * * and we don't know whether the carrier is an individual, a corporation, or a partnership. My idea is they are mostly individual owners of the boat, and often the captain is part owner.

Competition on the canal.—Severe competition from railroads has been encountered by the Virginia-Carolina Inland Steamship Company (Le Roy Steamboat Company). The character of this competition and the methods adopted by the railroads to drive this line out of business through the operation of the steamer *Newton* of the Dismal Swamp Steam Packet Company, is indicated below. Mr. Le Roy, president and general manager of the Virginia-Carolina Inland Steamship Company, states as the reason that his company has been able to continue business that the owners of the line are wholesale grocers and began the carrying business with one boat to carry their

own goods, many of the patrons being personal friends of the owners. The Virginia-Carolina Inland Steamship Company has sought to secure through shipping arrangements at Norfolk with the New York, Philadelphia and Norfolk Railroad Company, the Baltimore Steam Packet Company, and the Norfolk and Washington Steamboat Company. Such arrangements were refused by these companies, and to compel their acquiescence complaint was made to the Virginia State Corporation Commission. The defendant companies demurred to this complaint, resting their demurrer on the ground that the State commission had no jurisdiction or authority in the case, since the shipments in question were altogether interstate shipments; and further, that the commission had no power nor authority to compel the defendant companies to enter into a contract of the character sought by the petitioners. This demurrer was sustained by the decision of the commission so far as interstate shipments were concerned. The Virginia-Carolina Steamship Company then, in the spring of 1906, instituted inquiry at the office of the Interstate Commerce Commission at Washington, and was advised that while the Commission could give a ruling, yet it had no power to enforce any order, and that a proceeding before it would probably avail nothing.

Advantages of the Dismal Swamp Canal.—Several shippers over this canal stated to an agent of the Bureau of Corporations in the spring of 1906 its advantages and the extent to which persons living on the route of the canal depended upon it. A coal dealer at Newbern, N. C., said:

> We have been in the coal business here ten years, getting our supply from Philadelphia, Baltimore, and Norfolk through the canals. We probably get 1,500 tons annually. There are times when we want it quick, and then it has to come by rail, but we prefer the canals, and all coal comes that way under normal conditions. We get a better rate via the canal and it is more convenient to reach our yard by water. Bituminous coal is the only coal we get here by rail, and there is not much difference between the railroad and water rates. As to anthracite, the rail rates would be prohibitory. We get our bituminous coal from the Pocahontas mines, Virginia, sometimes by rail, but nearly all times by rail to Norfolk, thence through the canal by barge to our yard. Under ordinary conditions the water route is cheaper, but there are times in winter when barges are much engaged in carrying fertilizers, and to get water transportation at that time costs about as much as the railroad rate. The published all-rail rate is $2.05 per short ton from the mines to this city. The water rate from Norfolk to Newbern is 65 cents per long ton. The nature of tonnage through the canals is fertilizers, hay, grain, sash, hardware, cotton bagging and ties, coal, and general merchandise. A great deal of light freight comes through the canal, and when the merchants are not in a hurry they prefer their supplies brought via canal on account of less freight. There is no serious difficulty about slowness of transportation. It is surprising with what regularity we can get our goods by water. The canals need improving—that is, they should be made deeper and wider, which would be a good thing for east North Carolina. This section is very dependent on canals. It would amount to a calamity to our business men if the canals were closed. They are our only outlet. The sand bars along the coast make the water so shallow that there is absolutely no place of entrance and no way to get in here except via the canals. We are here in deep water with large enterprises and plenty of business, and we are cut off from the ocean by shallow water. If the canals were closed, we would be at the mercy of the railroads, which is a thing we do not even wish to consider.

A dealer in corn, grain, etc., in Newbern, said to a representative of the Bureau:

> We ship large quantities of feed through the canals from Norfolk to this city, probably 300,000 bushels of corn and 15,000 or 20,000 bushels of oats. We pay in corn 3 cents per bushel, and for oats 2½ cents, which includes rail and every other charge. We have nothing to do with rail rate and no special carrier. When we wish shipments to

be made from Norfolk we notify ship brokers and they find the carrier to bring our supply. We are very dependent on the canals, because steamers can not bring goods in bulk, and we would have to go to the expense of having it sacked.

Evidence to the same effect was furnished by a lumber operator of Elizabeth City, who said:

The opening of this waterway has had a decided tendency to keep railroad rates on a level. I am afraid the new railroad syndicate will get control of it. It has been thoroughly shown that it lowers railroad rates. Flour was 15 cents per barrel by railroad, and when waterways were opened it went down to 8, and I think it is now 10. We are on a basis of 4 cents per hundred by rail from here to Norfolk on manufactured lumber, or about $1.25 per 1,000 feet. By water it would be $1.10. Barge loads of manufactured lumber make more bulk than we usually sell, but when wholesale dealers in Baltimore and Philadelphia want it in large quantities it goes by barge.

He stated that the policy of the Norfolk and Southern road has been to drive out competition through the canal:

They have put many companies out of business and have worked hard to keep out the J. H. Le Roy Company, and have followed him with boats. They have cut the rates, but Le Roy has been able to hold out. The railroad would run boats at a loss, so I understand, to destroy competition. It was cheaper to do this than to buy the canal. The Norfolk and Southern some years ago brought cotton from some point on the Atlantic and North Carolina Railroad, say Kinston, to Newbern, shipped it on their boats to Elizabeth City, unloaded it here, and loaded it on cars and then took it to Norfolk for $1 per bale. From other points on Albemarle Sound and tributary rivers, when the distance was no more than half, but there was no competition, they charged from $1.25 to $1.50 per bale.

MINOR CANALS

Other canals of minor importance in North Carolina are the Fairfield Canal and the Newbern and Beaufort Canal. The former is a short canal, about 4 miles long, in Hyde County between Fairfield, N. C., and the Alligator River. It has considerable local importance, passing through a rich farming country having no railroad facilities. One boat, the steamer *Alma*, trading under the name of the Fairfield and Elizabeth City Transportation Company, uses the canal as a part of its regular weekly route between Elizabeth City and Fairfield. The canal is also used by an occasional sailing vessel. The steamboat company prorates with the Norfolk and Southern Railroad at Elizabeth City. The depth of the canal is about 6 feet, which seems to be deep enough to answer the purposes of the trade. Corn is moved between the middle of November and March and makes a busy season for the boat. The Albemarle and Chesapeake Canal Company is said to be a large stockholder in the Fairfield Canal Company, and, with the owner of the steamer *Alma*, is believed to hold a majority of the stock.

The Newbern and Beaufort is a small canal 3.2 miles long owned by the Newbern and Beaufort Canal Company, and is controlled by the Albemarle and Chesapeake Canal Company through stock ownership. It connects the head of Clubfoot Creek, which empties into the Neuse River, with the head of Harlowe Creek, a tributary to the Newport River, thus forming part of the 40 miles of waterway between Newbern and Beaufort.[a] The annual report of the Chief of Engineers, U. S. Army, 1906, p. 1152, says of this canal that the corporation owning it does very little, if anything, in the way of maintenance, and that the United States makes no expenditures on this canal, and makes

[a] Report of Chief of Engineers, 1906, part 1, p. 260.

no effort to keep the rest of the waterway in better condition than the canal itself. Hence, the value of the waterway is very much restricted, and its full value can never be developed so long as the above conditions prevail. Commerce for 1905 through this system of waterways amounted to 83,667 tons, a gain of 1,648 tons over 1904. It consisted principally of timber, lumber, fertilizers, cotton, cotton seed, cotton-seed meal and oil, hay, fish, grain, oysters, clams, and general merchandise. No toll charges are made on the canal. The manager of the Virginia-Carolina Chemical Company at Newbern, N. C., says:

> We ship via the Beaufort Canal to southern points, and if we could get an outlet at Wilmington we would use the canal more. This little canal serves a good purpose now, and if it were wider and deeper it would be a big help to us in getting goods from Charleston. * * * We are as much interested in opening up the southern route via the Newbern and Beaufort Canal as we are in the northern route. The Beaufort Canal is so small and shallow it is not adequate for large tow loads of heavy freight.

Another shipper at Newbern says:

> We ship lies through the Newbern and Beaufort Canal. There is a fine chance there for business if they put a little more water, but we can't get any appropriations to widen or deepen the channel, because, I suppose, the railroads are against us. Although they have trouble getting through this canal, they still continue to try to use it and to use it, and they have a good deal of trouble with the shallow water and get aground very often, and have to pole through it and use extraordinary means, but still they keep on trying to get through. It proves how useful it would be if it were deeper and wider. It would certainly open up a big business section.

STATE AND PRIVATE CANALS IN LOUISIANA

Louisiana has many small canals, some of them being used for drainage purposes. None of them are of much commercial importance. The more important are: 1, New Basin Canal; 2, Old Basin Canal; 3, Barataria and Lafourche Canal (known as Company Canal); 4, Harvey's Canal; and 5, Lake Borgne Canal. The New Basin Canal is owned by the State of Louisiana—the others are private canals. These canals are taken up separately below.

Several canals for oyster traffic have been built by the Louisiana Navigation and Fisheries Company in the last few years. This company at present controls the following canals: Bay Adam or Doullut Canal, Quarantine Bay Canal, Salt Works Canal, Meyers Canal, Bay Fontenette Canal, and Beppo Canal. These are all in southern Louisiana and were built to develop the rich fish and oyster industry on the lower coast. Other small canals used by oyster boats in southern Louisiana are the Stockfish Canal, Nestor Canal, and the Jurgewich Canal. The following table shows the date of the construction and the dimensions of the more important of these oyster canals:

Canal.	Date of construction.	Dimensions.		
		Length.	Width.	Depth.
		Feet.	*Feet.*	*Feet.*
Bay Adam	1905	[illegible]	15	7
Broadfish	1900	[illegible]	12	7
Nestor	[illegible]	[illegible]	25 to 35	7 to 15
Jurgewich	1900	[illegible]	15	[illegible]
Salts	1904	[illegible]	15	7
Quarantine Bay	1900	[illegible]	21	7

[illegible]

There are a number of other short navigation canals in the State, of small importance. In former years there were quite a number of navigation canals in the Red River Valley constructed around obstructions in the main channel of the river to connect the pools of clear water above and below the obstruction, but these have all passed out of use since the building of levees and the confinement of the waters of the Red River to the main stream. There are also quite a number of irrigation canals in the State, many of which are of considerable length and section, operated in connection with pumping plants of large capacities, most of which will perhaps ultimately develop into navigation as well as irrigation canals.

NEW BASIN CANAL

Description.—This canal is now owned by the State of Louisiana. It is 6.70 miles in length, with no locks, and extends from Rampart street, between Julia street and Howard avenue in New Orleans, to Lake Pontchartrain. The canal is 8 feet deep and 100 feet wide. New Orleans is the only town served by it.

Control.—The canal is managed by a board of control, of 5 members, appointed by the governor, the members of which act gratuitously. A superintendent and other officers are also appointed by the governor. The board of control and the superintendent make biennial reports to the governor.

Towing.—Towing on the canal is done by two towboats owned by the State. A toll of 30 cents per ton on the gross weight includes the towing of the vessel or barge from the mouth of the canal to its mooring place, and back to the mouth of the canal when unloaded.

Equipment and traffic.—The class of craft plying on the canal consists of small sailing vessels and barges. The work of handling barges on the canal is getting heavier every year, since the barges are "being built larger all the time."[a] This towing is done by the two tugboats referred to above, the *Meta* and the *N. S. Hoskins*, of 33 gross and 6 net tons and 24 gross and 12 net tons, respectively.

The average tonnage of the barges is from 90 to 100 tons.

During the period from May 1, 1904, to March 31, 1906, there were 6,298 arrivals in the canal and 6,119 departures. Receipts of produce during the same period[b] amounted to:

Molasses	barrels	473
Wool	bundles	312
Hides		951
Clay	barrels	22,390
Cotton seed	sacks	39,548
Cotton	bales	11,894
Lumber	feet	104,002,000
Wood	cords	31,197
Brick	thousands	18,125
Sand	barrels	2,410,130
Shells	do	665,100
Charcoal	do	872,115
Tar	do	198
Moss	bales	153
Shingles	thousands	9,210
Laths	do	7,337
Staves		1,131,460

[a] Report of board of control, 1904–1906, p. 5.
[b] Compiled from Report of Superintendent, 1904–1906.

Bean	barrels	[illegible]
Farm implements	[illegible]	[illegible]
Hay	barrels and bales	[illegible]
Poultry	coops	[illegible]
Eggs	cases	[illegible]
Potatoes	barrels and bags	[illegible]
Boxwood	pieces	[illegible]
Cypress	cases	[illegible]
Gravel	barrels	[illegible]
Helms	[illegible]	[illegible]
Junk iron and steel	pounds	[illegible]
Pecans, honey and pecans	barrels	[illegible]
	number	[illegible]
Logs	feet	[illegible]
Wharf piling and timber	pieces	[illegible]
Oranges	boxes	[illegible]
Beeswax	[illegible]	[illegible]
Fish	pounds	[illegible]

The above table includes only the actual freights reported in logs of the outgoing freight. These shipments came from points in southern Louisiana to Lake Pontchartrain. The estimated inbound tonnage for the period May 1, 1906, to April 30, 1907, amounted to [illegible] tons.[1]

Maintenance.—No money has been appropriated by the State of Louisiana for the maintenance or operation of this canal, but it depends entirely for its existence upon the money received from tolls. The canal is exceedingly in need of repair, and the excess of toll receipts over the salaries of the officers is devoted to keeping the canal open for navigation. The salaries of the officers (superintendent and other men on the canal) are small. The receipts for the year ending April 30, 1907, were $[illegible] and the expenditures were $[illegible]. The finances of the canal are handled by the board of control previously referred to, and the superintendent also appears to have some authority to make contracts for minor improvements and repairs.

Effect on freight rates.—So far as appears, navigation on this canal has no appreciable effect on railroad freight rates, nor does the change of seasons appear to affect the cost of transportation. No data regarding freight rates charged by the small sailing craft and barges are available.

History.—The canal was built by the New Orleans Canal and Banking Company, which was chartered for the purpose by the Louisiana legislature in [illegible]. The work of construction was completed in [illegible], the whole cost being $[illegible]. In [illegible], the canal reverted to the State and was leased to individuals until after the adoption of the constitution of [illegible], which provides that the canal should not be leased or alienated. In the following year the legislature provided for the appointment of a superintendent and other officers.[2]

OLD BASIN CANAL

Description.—The Old Basin Canal is owned by the Carondelet Canal and Navigation Company, a private corporation. It extends from North Basin street near Tulane street in New Orleans

[1] Estimate by [illegible], Secretary of Board of Control.

[2] History of New Basin Canal and Shell Road, by Henry L. [illegible], accompanying Report of Board of Control and Superintendent, 1896–1898, p. [illegible] et seq.

and connects with Bayou St. John, which empties into Lake Pontchartrain at Spanish Fort. The artificial waterway, or canal proper, is about 2.5 miles long; the Bayou St. John, from the point where the canal enters it, extends 4 miles to Lake Pontchartrain, making a length of about 7 miles. As in the case of the New Basin Canal, the only town served is New Orleans. The width of the canal at the water line is 55 to 65 feet, and the width at the bottom is approximately the same. The depth is about 7 feet. There are no locks.

Control.—The canal is owned and operated by the Carondelet Canal and Navigation Company, a private corporation organized under the authority of the Louisiana legislature by act of March 14, 1857. Act 74 of 1858 (37 An. 100) provides that the canal shall revert to the State in 1908.[a] The officers of the company are George Lhote, president; Fritz Jahncke, vice-president; W. P. Nichols, secretary, and J. M. Lamar, superintendent, all of New Orleans, La. The directors are L. S. Berg, W. C. Dufour, A. J. Rossi, J. V. Roca, W. H. Demoruelle, Victor Demoruelle, George Lhote, Fritz Jahncke, and Ivy T. Preston, all of New Orleans.

In the schedule submitted by the company it is stated that the amount of common stock authorized is $500,000, of which $214,000 has been issued. There is no preferred stock nor bonds or other indebtedness. In recent years the amounts and the rate of the dividends paid have been as follows—1896, $4,280, 2 per cent; 1897, $6,420, 3 per cent; 1898, $10,700, 5 per cent; 1899, $6,420, 3 per cent; 1900, $4,280, 2 per cent; and 1902, $3,210, 1½ per cent.

In the office of the attorney-general of Louisiana is a report made by a master in chancery on complaint of minority stockholders that the San Francisco (Frisco) Railroad was getting control of a majority of the stock and building their railroad on the canal property. This matter was never brought to issue.

Towing.—The motive power in use on the canal is steam, the canal company owning and operating one small steam tug for towing vessels. They say in their schedule:

> We operate a steam [tow boat] not for profit, but simply for the accommodation of our patrons, and charge simply enough to cover operating expenses and depreciation on the vessel.

The tolls are 30 cents per gross admeasured ton, which includes towing from the mouth of the canal to destination on the canal and back. A 5 per cent reduction from this rate is made if paid in ten days. Prior to 1878 this charge appears to have been 60 cents per ton; in 1878 it was reduced to 35 cents per ton, and the present rate has been in effect since 1902.

Equipment and traffic.—The canal company is not engaged in transportation. In addition to the steam tug, a barge boat and a pile driver are also owned by the company. The company owns no warehouse, but does own some real estate exclusive of the canal.

In reply to the query by the Bureau of Corporations regarding the total tonnage carried through the canal in 1904 and 1905 the company replied: "We have no control over cargoes and can not answer this." The New Orleans Times-Democrat of Sunday, September 1, 1907, how-

[a] History of New Basin Canal and Shell Road, by Henry L. Favrot, p. 52 included in Report of Board of Control and Superintendent of New Basin Canal, 1896-98.

ever, publishes the following figures as the statements of the canal company for the period from September 1, 1906, to August 22, 1907:

Tonnage of vessels	
Inward	[illegible]
Outward	[illegible]
Number of locking summer [illegible] and other boats	[illegible]

Cargoes

Lumber	feet	11,[illegible]
Grain	[illegible]	[illegible]
Timber	[illegible]	[illegible]
Sand	[illegible]	[illegible]
Shells	[illegible]	[illegible]
Wood	[illegible]	[illegible]
Brown sugar	[illegible]	[illegible]
Shingles	[illegible]	[illegible]
Hay	[illegible]	[illegible]
Gravel	[illegible]	[illegible]
Cotton	[illegible]	[illegible]
Piling	[illegible]	[illegible]
Lathe	[illegible]	[illegible]

The transportation of sand, timber, logs, and shells used in the operations of contractors and builders is the most profitable feature of the canal's business.

Regarding freight rates, the company's statement in the schedule submitted says:

We have nothing to do with freight. We simply charge vessels for the use of our canal. * * * It is impossible at short notice to give the names of vessels or average their freight rates, as they are mostly small sailing craft and keep no record of their cargoes.

The schedule also denies the connection with railroads of any of the transportation agencies operating on the canal, and further states that railroads have nothing to do with the freight on the canal.

The average tonnage of the boats is from [illegible] to [illegible] tons, mostly small schooners or barges.

Maintenance.—The earnings and expenses of the company were not reported in the schedule submitted. The maintenance of the canal is believed to amount to about $[illegible] a year, and the cost of operation and improvements to run about $[illegible], thus making an annual total of about $[illegible]. There are no receipts other than from tolls. The company grants no water rights. In reply to the query as to what permanent improvements have been made in the canal, the company replied:

Simply the building of a new lock valued at $[illegible] and general maintenance of the depth of channel which is now [illegible] as much as is required by our charter provisions.

The property is exempt from taxation.

History.—The Old Basin Canal connects to Lake New Orleans. The canal was built by Spanish adventurers in the early part of last century, a few years after the United States had purchased from France that territory including what was then known as Louisiana. The canal was owned by the heirs of the Spanish for many years, but in 1831 the Orleans Canal and Navigation Company was incorporated, the canal becoming the property of this company. The company's charter was to expire in fifty years and the canal property to revert to the state. There has been a great loss of business

between the corporation and the State as to the date of the expiration of the charter, the State officials maintaining that it would expire in 1907 and the corporation that the charter expires in 1908. This, however, is mere detail, as the canal will revert to the State and become State property, and is likely to be operated as the New Basin Canal is now operated.

General.—The Old Basin Canal is paralleled by the New Basin Canal, whose rules and regulations are practically the same. Neither of these canals is an important factor in transportation at present. Only light-draft vessels can navigate their waters, and as they do not connect with the Mississippi River their transportation is limited to products that are brought from the shores of Lake Pontchartrain and the surrounding country to the city of New Orleans, it all being simply local trade.

BARATARIA AND LAFOURCHE CANAL

Description.—The Barataria and Lafourche Canal, generally known as Company Canal, is owned by an individual, Mr. R. R. Barrow, of Westwego, La. The canal proper extends from the Mississippi River at Westwego, La., just above and opposite New Orleans, for about 7 miles to Bayou Barataria. Passing through the canal and various bayous and lakes, small boats can reach Houma, La., a distance of about 57 miles, including about 22 miles of artificial waterways. The system of water communication passes through the parishes of Jefferson, Lafourche, and Terrebonne and includes the bayous Barataria, De Allemands, Lafourche, and Terrebonne. It is open to navigation for the entire year.

At present craft can go as far as Houma, La. Preparations are being made to cut a connecting link between Bayou Terrebonne and Bayou Black at the town of Houma. This when completed will furnish a through route to Morgan City.

The width of the canal proper is 45 feet, with a depth of 6 feet. The canal was constructed about 1830. There is one lock, connecting with the Mississippi River. This lock can accommodate vessels of 160 feet length, 25 feet beam, drawing 6 feet of water.

Control.—As already stated, the canal is owned by R. R. Barrow of Westwego, Jefferson Parish, La. Mr. Barrow states that the canal is not leased to any railroad company, nor do the railroads prorate.

Towing.—Craft on the canal are propelled by gas, steam, and sail. No job towing company appears to operate exclusively on the canal. Mr. Barrow says, "We operate no boats;" and in reply to the query whether any of the transportation agencies operating on the canal are connected with railroads, he replied, "We know of none. We charge for use of canal and have nothing to do with the operation of the boats using canal."

Equipment and traffic.—The rate of toll is 50 cents per gross ton, but special rates are made to boats that make regular trips. No toll sheets are published.

Regarding freight charges, the statement is made, "All rates on freight carriers are governed by the railroad commission of this State" (Louisiana).

No record is kept of the annual tonnage movement through the canal. The canal freight consists mainly of lumber, sugar, moss, molasses, produce, fish, oysters, and game. In 1904, the chief State

[illegible]

Maintenance.—[illegible]

[illegible]

Location.—[illegible]

Area.—[illegible]

Equipment and traffic.—[illegible]

[illegible]

[illegible]

Location.—[illegible]

[illegible]

Area.—[illegible]

or other securities. Not long after the organization of the Lake Borgne Canal Company it leased the canal with all its property, privileges, and franchises to one William J. Kelly, with an option of purchase to the lessee, by lease to begin October 1, 1903, and to continue for a term of twenty-five years. Kelly assigned his interest to the Southern Transportation Company, which was by consent of the Canal Company subrogated to all the rights of Kelly under the lease. The lease recited that it was made dependent upon the exercise of an option of lease held by the Alabama Barge and Coal Company to lease the canal and its property, said option running until January 1, 1904. At a meeting held March 1, 1904, the directors of the Canal Company adopted a set of resolutions, which after reciting that since it was shown that considerable time must elapse before the canal could be properly operated under the lease, since the development of traffic was adverse on account of dullness in the export timber trade, and since it appeared to be to the interests of the Canal Company to take such action, the payment of rental provided for the first three years under the lease was suspended and was made subject to certain modified terms and conditions.

Some time prior to March 15, 1906, the Southern Transportation Company, which proved to be simply a couple of promoters, went into the hands of a receiver. Mr. Kelly, the original lessee of the company, was made receiver and proceeded to administer the affairs of the company. A special agent of the Bureau of Corporations who visited New Orleans in May, 1906, reported that the affairs of the Southern Transportation Company appeared to be in very bad shape, little or no business being done on the canal. The receiver had charge of all the books, and the secretary of the Southern Transportation Company was unable to furnish any information regarding the affairs of the company. At the time of the visit of the agent of the Bureau, the Canal Company expected to take charge of the canal in October, 1906. No dividends have ever been declared by the Lake Borgne Canal Company.

Towing and toll charges.—The towing and toll charges on the Lake Borgne Canal are shown in the rate circular as follows:

CRAFTS CONTAINING MATERIALS OTHER THAN COAL, LUMBER, OR TIMBER

Enrolled vessels, propelled by their own steam, 30 cents per gross registered ton for passage through canal and lockage.

Enrolled schooners, same as enrolled steam vessels, as above.

The tonnage of all noncargo-carrying craft, such as dredges, etc., will be charged on outside measurement of hull, at the rate of 30 cents per ton of 100 cubic feet.

Barges, when empty or carrying material not classed on this rate sheet, will be charged 30 cents per ton of 100 cubic feet, based on outside measurement of hull.

Luggers, pleasure yachts, and launches, under 30 feet, passage through canal and locks, under their own power, one way, $3. Above 30 feet in length, 10 cents per running foot.

Skiffs, rowboats, and canoes passed through canal and locks during regular lockings, 50 cents each. Special locking, $3.

CRAFTS CONTAINING LUMBER AND TIMBER

Crafts laden with lumber or timber, 65 cents per M superficial feet, with right to return empty free of charge, immediately after discharging cargo. Schooners, etc., having on board less lumber at 65 cents per M feet than amount of tolls, if charged according to their tonnage or length, as the case may be, will be charged according to their length or tonnage.

Piles in cribs or in barge, three-fourths of a cent per running foot.

Timber in cribs, 45 cents per M superficial feet.

Craft not to be loaded to exceed a maximum draft of 4 feet, and should be at least 4 inches by the stern, nor to a width over all of more than 30 feet, and during the low-water season the draft is not to exceed 3½ feet. Any delay or expense occasioned through noncompliance with these instructions will be at the risk and expense of shipper.

No outside engines will be permitted to pass through canal locks with barges or other craft in tow without paying full tolls, unless special arrangements are made to the contrary.

Barges when passing through the canal locked should have on board a manifest as to details of cargo, and in cases of lumber or timber, the amount of superficial feet on board.

In cases of necessity towage of barges for delivery to steamers and points in river will be arranged for by us in request and the actual towage rates paid by us will be charged for such service, we holding ourselves harmless and free from responsibility in case of delay or other circumstances over which we have no control.

All measuring of craft to be done by this company's superintendent at the canal, and no alternations will be permitted, no other measurements will be accepted.

Equipment and traffic.—As to transportation on the canal no definite information is available. The company does not own any boats, but the barges navigating the canal average about 400 tons. As the State exercises no supervision over this canal there are no reports of supervising bodies. There are no returns for taxation nor any records with the attorney-general of the State. This canal should be an important factor in transportation, but it has been unfortunate in its management. On the completion of the improvements now being made in the Warrior and Black Warrior rivers in Alabama, an inside all-water route via the canal will be available from the coal fields of Alabama to New Orleans, and under proper management the coal traffic through the canal should assume considerable proportions.

A large coaling plant was erected by a corporation known as the Mississippi River Coaling Company at the mouth of the canal where it enters the Mississippi River, about 10 miles below New Orleans. The object of erecting this plant was to supply vessels with coal. It is located just outside the harbor limits of New Orleans, so that a foreign vessel cannot stop there to receive coal or take on a cargo of any kind without special permission from the Secretary of the Treasury. This would necessitate the employment of a considerable additional force of Government inspectors, and this additional cost is prohibitive to an operation of the coaling plant. C. Jones & Co., of Pittsburg, were largely interested in this coaling project, and at a sale of the plant in September 1907, to satisfy a judgment of $80,000 rendered in their favor, one of their subsidiary corporations was the highest bidder, acquiring the property for $15,000.

Effect of canal on general freight rates.—No data are available regarding this subject, but under present conditions the canal can hardly be said to be a factor in fixing railroad rates.

Receipts, expenses, and maintenance.—No definite data regarding expense of maintaining this canal are available since the canal has been leased to the Southern Transportation Company. The following revenues were received from operations while the Canal Company was operating the canal:

From August 15, 1905, to December 31, 1906	$4,[illegible]
From January 1, 1907, to December 31, 1907	21,[illegible]
From January 1, 1908, to June 30, 1908	[illegible]
Total to June 30, 1908	[illegible]

Capitalization and indebtedness.—Of the common stock 2,476 shares of a par value of $100 each and 774 shares of preferred stock of the same par value were outstanding on March 30, 1906. The debt of the company consisted of two outstanding notes amounting to $13,500. There was no mortgage debt. The assessed valuation in 1903 was $290,000.

History.—As early as 1855 the legislature of Louisiana authorized the construction of a canal in St. Bernard Parish to connect the waters of Lake Borgne with the Mississippi River, near the English Turn, but only through and upon the plantation owned by one Stewart, the grantee. In 1868 a corporation known as the Mississippi and Mexican Gulf Ship Canal Company was organized to open the canal under the franchise granted to Stewart. In 1873 the property was sold on execution of a judgment against the company, and after several other sales it was sold in 1881 by the State for taxes. In April, 1884, the property was acquired by the St. Louis, New Orleans and Atlantic Canal and Transportation Company.

In 1885 the property was again sold for taxes. In April, 1887, it was bought by the St. Louis, New Orleans and Ocean Canal and Transportation Company. In 1895 the property was again sold at sheriff's sale in execution of a judgment, and was bought by one Wheelwright. Subsequently the canal property was acquired by one Sanders, and by him sold to the Lake Borgne Canal Company. Its subsequent history is given in the foregoing sections of this sketch.

CANALS IN OREGON

The canal and locks at Oregon City, Oreg., were built during the years 1870-1872 by the Willamette Falls Canal and Locks Company and were opened for traffic in 1873. They were sold March 8, 1876, to the Willamette Transportation and Locks Company and again sold in 1892 to the Portland General Electric Company. The stock of the latter company is now owned by the Portland Railway, Light and Power Company. By the terms of the State legislative act, dated October 21, 1870, the State could have taken possession in 1893 on payment of their actual value, but the option was allowed to lapse.

On March 3, 1899, a board of United States engineers was ordered to examine the locks and report on the desirability of their acquisition by the United States Government. It is from their report that this description is taken. This board reported in favor of the acquisition, provided the works could be obtained for a reasonable sum. They reported, also, that they regarded $1,200,000, the price demanded by the present owners, as excessive. The cost of construction was $600,000.

The locks and canal consist of a flight of 4 locks having a lift of about 10 feet each, a canal basin just above these about 1,250 feet long, and a guard-lock 210 feet long connecting this basin with the upper level. An upper entrance about 1,000 feet long makes the total length of the canal, including the locks and entrance, about 3,500 feet. The lower part of the canal, including 4 locks, is roughly cut in the solid rock, and wooden fenders are placed at intervals, to protect the sides of the vessels passing through the canal. There is a low dam along the crest of the natural fall in order to secure an even crest and to raise the water surface probably not over 18 inches or 2 feet.

The works are in bad repair and little is being done to improve them. The water in the canal is used for manufacturing purposes to such an extent as to seriously interfere with the usefulness of the canal to navigation. As a waterway this canal leaves much to be desired.

The following table shows the results of its operation, so far as data are available:

Date.	Tons of freight.	Revenue.	Expenditures.	Net earnings.	Date.	Tons of freight.	Revenue.	Expenditures.	Net earnings.
1882	12,614				1891	20,773			
1883	20,281				1892	24,339			
1884	24,463				1893	20,209			
1885	20,711				1894	20,657	$27,520	$5,449	$24,082
1886	21,020				1895	25,499	29,719	4,255	24,116
1887	22,240				1896	20,512	25,266	4,154	21,210
1888	20,707				1897	20,100	22,488	2,388	20,731
1889	27,259				1898	20,569	22,488	2,077	20,403
1890	20,497				1899	22,225			

In the Census Report on Transportation in 1880, page 21 of the section on operating canals, it is stated that the Willamette Transportation and Locks Company is a corporation controlled by the Oregon Railway and Navigation Company. In a letter dated August 28, 1907, Mr. F. G. Sykes, general manager of the Portland General Electric Company, states that the Portland General Electric Company acquired the canal and locks from the Willamette Transportation and Locks Company but that, so far as he knows, neither the Oregon Railway and Navigation Company nor any of its stockholders own any stock in the Portland General Electric Company, or in the company operating the canal and locks. Furthermore that the Oregon Railway and Navigation Company, as far as he knows, will have no stock or other interest in the successor to the Portland General Electric Company (Portland Railway, Light and Power Company), nor will this successor or any of its stockholders hold any interest in the Oregon Railway and Navigation Company.

The toll collector at the locks is the local station agent of the Oregon Railway and Navigation Company (Southern Pacific) at Oregon City. One-half of his salary is paid by the Oregon Railway and Navigation Company for his services as agent of that company, and the other half is paid by the Portland General Electric Company for his services as toll collector. Mr. Charles H. Carlisle, secretary of the Portland General Electric Company, was formerly secretary of the Willamette Transportation and Locks Company.

The principal transportation agencies operating on the Willamette River and passing through the canal and locks are several steamers operated by the Oregon Railway and Navigation Company and the boats of the Oregon City Transportation Company. Lines of the Southern Pacific Railroad parallel the Willamette River on each side.

Sections 4145 to 4156 of the Oregon Code contain certain regulations enacted in 1874 and 1882 for the control of the canal at Willamette Falls. The maximum charge for passage through the canal and locks must not exceed 50 cents per ton for freight and 15 cents for each passenger carried. The governor, secretary of state, and State treasurer are constituted a board of canal commissioners, which has power at all times to visit the canal and locks, is authorized and required to bring any action necessary to compel the Willamette

Falls Canal and Locks Company or any party claiming under them to keep and maintain the canal, and whose consent is necessary for any repairs or improvements unless of immediate emergency. Boat owners using the locks are required to make out two certified lists of freight tonnage and passengers passing through the locks, one of which shall be tendered to the agent of the locks company and the other to the secretary of the board of canal commissioners. Quarterly reports of business passing through the locks must be certified by the locks company to the board.

BOAT TOLLS AND FREIGHT TOLLS ON CANALS

Certain selected boat tolls and freight tolls exacted by such of the several important canals as charge toll are repeated in the following summarized form. A noticeable feature of this compilation of tolls is the lack of uniformity in the rates of charges and the basis on which they are assessed. An examination of these toll charges indicates one of the important reasons for the decline of canals as agencies of through transportation of freight. The multiplicity and aggregate amount of boat and freight tolls through the canals, say, from the sounds of North Carolina to New York City, as well as the uncertainty in fixing liability among so many agencies in case of damage, renders the use of the inside route by through lines at present impracticable. No thorough analysis of these charges is here attempted. It should be noted that in some cases the toll and freight charges are not separated, and in others that only the toll charges are shown. For further information regarding these charges reference should be made to the section on tolls shown under each canal on preceding pages.

Summary of Through Boat Tolls on Canals

LOADED, EXCLUSIVE OF LOCKAGE

Delaware and Raritan Canal (*length, 44 miles; 66 miles, inclusive of feeder*).—Canal boats and barges 4 cents per mile. Consort towed by steamer with cargo similar to steamer pays same boat toll as steamer. Sailing vessels loaded with melons, fruit, and vegetables, $2.28 each way. Steamers with merchandise other than full cargoes of fourth, fifth, and sixth class freight, $20 in addition to cargo toll; with cargo of 100 tons or more fourth, fifth, and sixth class through freight, $2.28.

Morris Canal (*length, 106+ miles*).—No data.

Lehigh Canal (*length, 48 miles*), *Delaware Division Canal* (*length, 60 miles*).—No data.

Schuylkill Navigation (*length, 90 miles*).—Boats whose cargo toll amounts to $15 or more are passed free of boat tolls. Boats whose cargo toll is less than $15: One way, 15 miles or under, $1.50; one way, 15 to 30 miles, $2; one way, 30 to 60 miles, $2.50; one way, over 60 miles, $3.

Chesapeake and Ohio Canal (*length, 184+ miles*).—No data.

Chesapeake and Delaware Canal (*length, 13+ miles*).—Vessels whose cargo toll does not exceed the empty boat toll are considered empty and pay empty toll.

Albemarle and Chesapeake Canal (*length, 14 miles*).—All tolls are charged on gross tonnage of vessels, with the following exceptions: Vessels measuring 100 tons or less, loaded or partially loaded, 25 cents per ton; between 100 and 150 tons, loaded or partially loaded, 18 cents per ton; over 150 tons, 12 cents per ton. Barges are charged according to number of square feet, surface measurement. Tugboats from 60 to 125 feet in length are charged from $5 to $20 each trip, according to size. Minimum amount of toll on any vessel $1.50.

Upon application owners of tugboats plying regularly through the canal will be allowed half rates on tugs with tow. This does not apply to tugboats without tow.

Miami Fowing Canal. length, 22 miles.—On vessels of all kinds measuring 100 tons or less, tolls are collected on all tonnage of vessels without reference to cargo, as follows: Loaded or partially loaded, 25 cents per gross ton. On all vessels over 100 tons, loaded or partially loaded, tolls are collected as per toll sheet. Steamers and sloops, minimum toll, $1.50; other vessels, $2.50. Tugs towing from 60 to 125 feet are charged toll ranging from $5 to $20 each trip. Boats plying regularly through the canal are allowed half rate in application for tags with lower toll rates, but this does not apply to tags without lower.

Illinois and Michigan Canal. length, 96 miles.—On freight boats, 5 cents per mile.

Ohio State canals. Ohio and Erie, 308 miles. Miami and Erie, 156 miles.—*Ohio and Erie.*—Steamboat. On each canal boat used chiefly for transportation of freight, 2 cents per mile. On each barge used for transportation of coal, 2 cents per mile, but not over $5 for any voyage. On each vessel used chiefly for passengers, 5 cents per mile. Steamboats under 60 tons, 5 cents per mile. Sailboat. On each canal boat used chiefly for transportation of freight, 2½ cents per mile. Steamboats under 60 tons, 4 cents per mile. Steamboats over 60 tons, 10 cents per mile. Steamboats exclusively for towing, 5 cents per mile. *Miami and Erie.*—On each canal boat used chiefly for transportation of freight, 2½ cents per mile. On each vessel used chiefly for passengers, 4 cents per mile. On each barge used for transportation of coal, 2½ cents per mile, but not over $5 for any voyage. On each sailing vessel used chiefly for passengers, 4 cents per mile. Steamboats, 60 tons, 10 cents per mile. Steamboats exclusively for towing, 10 cents per mile.

Special rates seem to prevail in given points.

IOWA

Delaware and Lorain Canal.—Canal boats and barges in tonnage of steamers which are light, $2.25. Boats 10 tons or less, $2.25; 11 to 50 tons, $5; 51 to 100 tons, $1.50; 101 to 150 tons, $4; over 150 tons, $10; boats with full cargoes of pig iron, lumber, and iron ore one way free of toll; and lumber and iron ore one way free of toll; way boats, $1 each way; barges, $1.

Keokuk Navigation. length, 10 miles.—Light boats in coal transitions, sing lime, cordwood, and other regular full cargo trade are returned toll free to regular loading places. Tugs towing from Montrose to Fairmount Dam and above free of toll when handling boats paying cargo toll, or when returning same light to Montrose.

Chesapeake and Delaware Canal. length, 14 miles.—Vessels under 40 tons, $4; 40 to 60 tons, $6; 60 to 120 tons, $8; 120 tons and over, $10. Vessels returning empty within thirty days after paying cargo toll may pass toll free.

Albemarle and Chesapeake Canal. length, 14 miles.—Vessels measuring 100 tons or less, 50 cents per ton; between 100 and 150 tons, 1 cent; over 150 tons, ½ cents.

Cumbrel Fowing Canal. length, 22 miles.—Minimum canal boat toll, $1.50; barges, 25 cents per gross ton, same 40 cents per M feet B. M. tug boats 60 feet or less in length, $5; over 125 feet, $20. Half rates to regular towboats with lower in application. Vessels going one way light, charged with toll; but if returning loaded within thirty days, half toll; if cargo toll are then 50 per cent more than amount paid.

Illinois and Michigan Canal. length, 96 miles.—On freight boats, 1 cents per mile.

TABLE 95—*Summary of through freight tolls on canals*

Article.	Delaware and Raritan Canal (length, 44 miles; 66, including feeder).[a]	Morris Canal (length, 106+ miles).	Lehigh Canal (length, 48 miles). Delaware Division Canal (length, 60 miles).	Schuylkill Navigation (length, 90 miles).	Chesapeake and Ohio Canal (length, 184+ miles).[c]	Chesapeake and Delaware Canal (length, 13+ miles).
Coal		Average, 65 4 cents per ton.	Bituminous, 0.6 cents per ton mile; anthracite, 0.45 to 3.25 cents per ton mile.	Anthracite, from 67 cents to $1.12 per gross ton.[b]	Coastwise, 10 cents; Washington, 25 to 50 cents.	20 cents per gross ton.
Fertilizer and fertilizer material.	35 cents per gross ton through, 1 cent per mile way.			45 cents per net ton		15 to 50 cents per ton.
Grain:						
Wheat	35 cents per gross ton through, 1 cent per mile way.					1 cent per bushel.
Rye	do					Do.
Corn	do					Do.
Barley	do					Do.
Malt	do					Do.
Oats	do					¾ cent per bushel.
Ice	do			45 cents net ton		30 cents per ton.
Iron:						
Pig	do			Iron pipe, 45 cents net ton.		20 cents per ton.
Railroad	40 cents per gross ton through, 1.2 cents per mile way.					Do.
Iron ore	35 cents per gross ton through, 1 cent per mile way.					15 cents per ton.
Limestone	do			Lime, 45 cents net ton		20 cents per ton.
Lumber	In boats, 35 cents per gross ton through, 1 cent per mile way; rafts, 45 cents through, 1.5 cents per mile way.		Hemlock, per 1,000 B. M., 1 cent per mile; pine and other, per 1,000 B. M., 1½ cents per mile.			30 cents per 1,000 B. M.
Oil						Petroleum, 6 cents barrel; other, 9 cents barrel.

Article	Illinois and Chicago (under 1 mile length, 14 miles)	Illinois and Ohio (over 1 mile length, 33 miles)	Illinois and Michigan (over 1 mile length, 30 miles)	Ohio State canals (Ohio and Erie, 308 miles): Ohio and Erie, Cleveland	Miami and Erie, Indiana
Coal	30 cents per ton	18 cents per gross ton	1 mill per 1,000 pounds per mile	1 mill per 1,000 pounds per mile, and for vessel any distance, 15 cents	3½ mills per 1,000 pounds per mile, and for vessel any distance, 15 cents
Pottery and kiln-fired material	30 cents per ton	do			
Grain:					
Wheat	1 cent per bushel			3 mills per 1,000 pounds per mile, and for vessel any distance, 15 cents	3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents
Rye	do			do	do
Corn	1 cent per bushel	1 cent per bushel		4 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	
Barley	1 cent per bushel			3 mills per 1,000 pounds per mile, and for vessel any distance, 15 cents	3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents
Malt	2 cents per hundred weight			3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	do
Oats	1 cent per bushel			3 mills per 1,000 pounds per mile, and for vessel any distance, 15 cents	3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents
Ice	30 cents per ton	15 cents per net ton	1½ mills per 1,000 pounds per mile	4 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	4 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents
Iron:					
Pig		All kinds, 15 cents per gross ton	1 mill per 1,000 pounds per mile	3½ mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents
Railroad			do	3 mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	do
Iron ore	30 cents per ton		1 mill per 1,000 pounds per mile	3 mills per 1,000 pounds per mile, and for vessel any distance, 15 cents	1 mills per 1,000 pounds per mile, and for vessel any distance, 15 cents
Limestone					
Lumber	10 cents per 1,000	Sawed, 10 cents per 1,000	Sawed, 2 mills per 1,000 feet per mile		
Oil	10 cents per barrel	10 cents per barrel		3½ mills per 1,000 pounds per mile, and for vessel any distance, 30 cents	

* When boats are towed by other than company's or contractor's steamers, tolls are 30 per cent above these rates. If towed thus on only one side of canal and river system, 50 per cent above these rates, provided the charge is not over 3 cents per ton per mile.

† Includes loading and unloading.

‡ First class freight, 1 cent per ton per mile for the first 30 miles and ½ cent per ton per mile for each additional mile. Second class freight, 1 cent per ton per mile for first 30 miles and ½ cent for each additional mile.

§ Other articles from manifestos, 3 cents per hundredweight.

‖ Tolls exclusive of lockage.

8. RELATION OF WATER TRANSPORTATION TO RAILROAD RATES

WATERWAY COMPETITION

It has been claimed that water competition is a safeguard against exorbitant charges by railroads through large sections of the country. It is undoubtedly true, at any rate, that water competition is a potent cause of local discriminations in railroad rates.

The importance of water competition depends very largely upon whether it is by canal, river, lake, or ocean. In other words, it appears to vary with the physical characteristics of the navigable waterways employed and the number and size of the vessels which can be used thereon.

Canals.—The importance of canals as regulators of freight rates is much less than formerly, even in those cases where the canals are still in use. The number of boats in use on the Erie Canal has declined, and with this has gone a decline in the proportion of traffic, even of the bulky commodities carried by canal. Most of the canal traffic consists of ice, lumber, stone, lime, and coal. In 1900 less than 8 per cent of the flour and grain received at New York came by the canal.[a]

In 1898, Mr. Carnegie, in speaking before the Pittsburg Chamber of Commerce, said:

> Such has been the progress of railway development that if we had a canal to-day from Lake Erie through the Ohio Valley to Beaver, free of toll, we could not afford to put boats on it. It is cheaper to-day to transfer the ore to 50-ton cars and bring it to the works over our railway than it would be to bring it by canal.

Under the present conditions, with slow, small boats, the Erie Canal is said to have little, if any, influence upon rates. On the contrary, canal rates on grain are now said to be made in accordance with the rates by rail. The improvements in progress will doubtless increase the effectiveness of the canal.

The following tables, however, show a marked difference in the ton-mile rate from New York to canal points over the New York Central and Hudson River Railroad and other lines and to non-canal points on the Pennsylvania and Lehigh Valley lines. In some cases, as in the Albany rate on third-class freight, water competition seems to have compelled a rail rate little more than half as high in proportion to the distance as the Philadelphia rate, but in this instance the water competition is by river and not by canal. Inland canal points, however, take more favorable rates than are made by the Pennsylvania lines, in some cases the ton-mile rate to canal points being little more than five-eighths of the Pennsylvania rate.

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[a] Final Report of Industrial Commission, page 434. See also Report of the New York State Committee on Canals, 1899, and Report of the New York Commerce Commission of 1900.

TABLE 16.—*Railroad rates in high-class freight.*[1]

[illegible]

New York Central and Hudson River Railroad freight tariff No. 497, taking effect August 20, 1896.
West Shore Railroad freight tariff No. 241, taking effect September 2, 1894.
Erie Railroad freight tariff No. 480, taking effect August [illegible], 1897.

In cents per 100 pounds.

From New York to	First class.	Second class.	Third class.	Fourth class.	Fifth class.	Sixth class.
Albany	22.1	18.1	14.1	11.1	9.1	10.1
Utica	22.1	17.1	16.1	13.1	14.1	12.1
Rome	23.1	20.1	15.1	13.1	14.1	12.1
Syracuse	23.1	20.1	15.1	16.1	15.1	12.1
Rochester	23.1	20.1	15.1	16.1	15.1	12.1
Buffalo	23.1	22.1	20.1	19.1	16.1	12.1

In mills per ton mile.

Albany	31.1	25.2	17.7	16.1	12.1	12.7
Utica	17.1	24.7	18.7	14.1	9.1	10.1
Rome	20.1	21.2	18.2	13.7	7.1	8.7
Syracuse	14.1	20.7	17.2	12.7	11.1	8.1
Rochester	16.1	16.2	12.4	8.7	4	7.1
Buffalo	7.7	12.1	12.7	6.1	7.1	6.1

[illegible]

Pennsylvania Railroad Company new freight tariff from New York.
Lehigh Valley Railroad tariff No. 1 [illegible], taking effect August [illegible], 1896.

In cents per 100 pounds.

Philadelphia	22.1	18.1	15.1	11.1	11.7	9.7
Reading	20.1	21.1	21.1	17.1	21.1	[illegible].1
Wilkes-Barre	23.1	20.1	22.1	17.1	15.1	12.1
Harrisburg	21.1	20.1	21.1	17.1	21.1	12.1
Altoona	16.1	20.1	20.1	21.1	18.1	7.1
Pittsburg	16.1	20.1	20.1	21.1	18.1	[illegible].1

In mills per ton mile.

Philadelphia	20.1	10.1	15.1	17.1	22.1	21.1
Reading	10.7	14.1	25.1	20.1	18.2	22.1
Wilkes-Barre	10.1	16.1	20.7	11.1	17.7	22.1
Harrisburg	13.4	25.1	22.4	7.4	15.4	22.1
Altoona	17.1	22.1	18.1	12.4	[illegible].1	1.2
Pittsburg	20.2	7.1	11.1	1.1	4	1.4

[1] From Report of the Committee on Canals of New York State, 1898, p. 13.

Rivers.—The influence of navigable rivers on railroad charges varies with the length of the navigable route and also with the depth, wharfage facilities, etc. The number and size of the boats used necessarily vary with the circumstances mentioned. The most important river route in the country is that extending from Pittsburg to New Orleans, by way of the Ohio and Mississippi rivers, but even on the Mississippi the number of boats and investment of capital therein has declined, though there has been some slight improvement since 1890. The Mississippi is paralleled on both sides by railroads operating long trains over easy grades at the least possible cost. River steamers can still underbid the railroads to some extent on local traffic, but they are at a disadvantage in loading or terminal expenses, and in insurance of risk, as well as on account of the rise

and fall of water in the river. It is claimed that the railroads take traffic at unduly low rates along the river and at competitive points generally, and recoup themselves by high charges at non-competitive points; but in water traffic there are practically no noncompetitive points, and steamboat lines are compelled by the necessities of the case to make their rates with some regard to distance.

The Ohio-Mississippi traffic in lumber and coal has not declined, for the railroads can not compete for this business when coal, for example, is carried from Pittsburg to New Orleans at a cost of less than $2 per ton, or less than 1 mill per ton-mile; and it is claimed that $1 per ton or even less will cover the cost.

Water competition on the small rivers of the South is of comparatively little effect under existing conditions. It limits the rates to some extent, but the steamers are so small, the service so irregular, and the insurance, risks, etc., so great that the railroads practically control the business. Moreover, it appears that in some cases the steamboat lines are controlled by the railroad interests, while in other cases there is a division of the business which leaves the steamers only a fixed proportion of the low-grade freight.[a]

Attempts have been made to create effective water competition at Nashville and Chattanooga without much success. A witness before the Senate Committee on Interstate Commerce declared in 1897 that there was no more water competition there than in the Rocky Mountains. In short, it appears that the railroads put in force rates so low as practically to drive the water lines out of business; the boats still in use are inadequate to handle any considerable proportion of the traffic.

The Great Lakes.—The length of the routes on the Great Lakes and the depth of water (aided by channel and harbor improvements), has permitted the use of large vessels steadily increasing in size and has correspondingly reduced the cost of transportation. This has resulted in rates of freight, which on some commodities are far below the possibility of railroad competition, and on other articles are active factors in determining the rail rates on competing lines. The advantages of the lake routes are further shown by the fact that all the important trunk lines of railroads control lines of vessels operating on the Great Lakes; this railroad control of lake lines reducing the effectiveness of the water competition on most freight except ore and coal and possibly lumber.

Coastwise traffic.—What has been said of lake competition applies also in a measure to coastwise traffic. The regular lines of steamers between north Atlantic and south Atlantic ports, as well as the local coastwise lines, do a large business. There is also a large movement by sailing vessels, and at least a chance of competition by tramp steamers, although both of these seem to be of diminishing importance. By these various water lines, freight rates on bulk commodities and also, to a large extent, on package freight are so much below railroad rates that the rail lines can hardly be said to compete for a large part of the traffic. The influence of water competition is, however, reduced to some extent, as on the lakes, by the control of

[a] See Dawson, Griffin, Hawkinsville, Troy, and Hampton cases before the Interstate Commerce Commission.

several important coastwise lines by railroad interests, either through ownership of stock or in other ways. These and other coastwise lines are members of traffic associations in which railroad interests are also represented. In many cases, too, joint rail and water rates are determined in cooperation with the railroads. Some classes of freight, however, demanding rapid movement, do not go by water under normal circumstances.[1]

The long and short haul clause.—Making all allowances, it appears that competition upon the Great Lakes and along the coasts offers some justification for allowing railroads to charge less for a longer than for a shorter haul over the same line, under the section of the interstate-commerce act of 1887 which prohibits such charges "under substantially similar circumstances." The interpretation of this section has been gradually worked out in a series of decisions by the Interstate Commerce Commission and the United States Supreme Court, so as to permit rail carriers to make a lower charge to water competitive points than to non-water competitive points, although the latter involves a shorter haul.

The principle of the long and short haul clause had been recognized by many of the States before the enactment of the interstate-commerce act. In Massachusetts, for example, no concession in rates was allowed even at Provincetown, on the point of Cape Cod, 130 miles from Boston by land, as compared with the rates at any of the intermediate points on the continuous railroad route along the cape. This gave the water lines a marked advantage.

In the interpretation of the long and short haul clause of the interstate-commerce act, Judge Cooley's decision in the Louisville and Nashville case indicates a policy which, so far as the effect of water competition is concerned, has remained practically unchanged. Continuous consideration of dissimilar circumstances and conditions in the administration of the law were stated to be the existence of water competition or of the competition of other carriers not subject to the statute, and "rare and peculiar" cases of competition between the railroads subject to the statute. The Commission held that no distinction would be recognized between local traffic and through traffic, and that expense to the carrier involved would not ordinarily be recognized as a factor. Above all, the desire to encourage manufactures or to build up business in trade centers was not admitted as an allowable exception from the prescribed rule.

The significance of the case of the Chicago and Northwestern Railway v. Ostrom, the question of "separate and independent line" decision, is discussed in the third and seventh reports of the Interstate Commerce Commission. Final interpretation of the section in question was obtained from the Supreme Court in the Social Circle case. The court overruled the lower courts and practically reestablished the Commission's interpretation of the word "line," namely, that when a continuous line for through traffic is formed by several railroads the roads constituting the line and making use of it are merely parts of the through route and not separate lines; but being able to constitute themselves separate lines through mere traffic contracts, they must establish their through charges to the rates made to local business.

[1] Final Report of Industrial Commission, pages 516 to 517.

In the Alabama Midland Railway case (1896) the Circuit Court of Appeals held that:

> The volume of trade to be competed for, the number of carriers actively competing for it, and a constantly open river present to take a large part of it whenever the railroad rates rise up to the mark of profitable water carriage, seems to us * * * to constitute circumstances and conditions at Montgomery substantially dissimilar from those existing at Troy.

This view was sustained by the Supreme Court.[a]

Discrimination between eastern and western cities.—In the Cincinnati and Chicago freight bureau cases, representing the claim of western cities to compete in the southern States on equal terms with eastern centers, it was claimed that the adjustment of rates between the lines east and west of the Alleghenies had been made upon a basis permitting the West to engage in the southern trade only in products of the farm and field, reserving to eastern centers the business of supplying the South with manufactured products. The rates into the so-called southern differential territory from Cincinnati and Chicago are, as a matter of fact, considerably higher for equal distances than from New York and Boston. The railroads have claimed that the lower rates from eastern centers are almost entirely the result of cheap water transportation along the seaboard.

On the other hand, the roads east of the Alleghenies are prevented from making certain concessions—for example, in cotton rates northward—by the opposition of competing carriers up the Mississippi and Ohio valleys; and these western roads are prevented from reducing rates from western trade centers by threats of rate wars over the eastern lines, especially those operated in connection with coastwise steamship lines. The result is an exceedingly hard and fast adjustment, permitting of no concessions on either side without equivalent concessions on the other; thus rates are maintained on practically the same basis as in the later seventies. In view of the growth of the textile industry in the Carolinas, resulting in an enormous consumption of cotton within those States, the eastern roads desired to equalize conditions as between the northern and southern mills; but certain of the other roads, having no interest in the southern mills, but interested in New England industries, tried to prevent such concessions. At times rates have been 59 cents from Mississippi points to South Carolina when they were 55½ cents to New England.

The situation in the South is peculiar, owing to the number of miles of navigable water courses reaching from the ocean, Gulf, and Mississippi into the interior. The railroads claim that in order to secure any portion of the traffic to points where water competition exists, low rates must be made irrespective of the rates to intermediate, noncompetitive points; that to lower all rates to a competitive level would lead inevitably to bankruptcy.[c]

Transcontinental traffic.—At a hearing before the Interstate Commerce Commission in 1900 (Kindel *v.* Atchison, Topeka and Santa Fe Railway Company), water competition from New York to the Pacific coast, via the Cape Horn and the Isthmian routes, was advanced as a justification for lower rates made by the trans-

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[a] 41 U. S. Appeals 453; 168 U. S., 144, 172, 176.
[b] Final Report of the Industrial Commission, p. 444.
[c] Final report of Industrial Commission, pages 374 to 376.

continental railroads from New York and central points from the Missouri River east to the Pacific coast as compared with the rates from such intermediate points as Denver to the same destination. A peculiarity of this situation was that while the alleged competition was from New York, the rates from Chicago, St. Louis and Missouri River points west to the coast were no more than from New York; and the higher rates seemed to apply only from points west of the Missouri River. Moreover, rates from eastern points to intermediate points such as Denver had been higher than the through rates to the coast terminals. The Interstate Commerce Commission held that rates at Denver to or from the East or to or from the Pacific Coast ought not to be higher than those between San Francisco or other Pacific Coast terminals and the Missouri River or points east.

On the other hand, in many cases the railways are probably carrying goods at less than cost, at least if the traffic be charged with its proportion of fixed charges, for the purpose of securing our water competition. It is evident that in such cases an increase in the rail rate would be an advantage to all concerned, for it would restore certain bulky traffic to the waterways, where it economically belongs, and leave the railway equipment available for traffic properly moving by rail, at the same time making possible a reduction of other rail rates by securing of business now at a loss and by increasing the volume of profitable business. Nor should the railways fear the restoration of water traffic to this extent, for the history of water transportation shows that it frequently makes traffic for the railroads more than sufficient to make up for the apparent loss of business.

The development of water transportation, which should be the cheapest form of transportation for large classes of commodities, would seem to be a necessary factor in the industrial development of the country and to be among the least of the factors which should be relied upon in our commercial competition with foreign countries.

TESTIMONY BEFORE THE INDUSTRIAL COMMISSION

In connection with the consideration of the effect of water competition in certain sections of the United States, as an influence in determining railroad policies and rates in those sections, the following extracts from the testimony taken at the meetings of the Industrial Commission in 1899–1901 is of interest.

Statement of S. R. Calloway, president New York Central and Hudson River Railroad Company, Oct. 8, 1899:

The large bulk of the grain I take in during the summer months comes to us from vessels from all ports. Now that transportation is usually very small. It has been rather higher this year on account of the activity in the steel trade. The vessels finding they could get better rates for the iron ore and the ice-carrying business, not usually the competition between these ports makes transportation from Chicago to Buffalo almost nothing. Last year the rates got down, I think, as low as three-fourths of a cent a bushel, and that added to our business in whatever the rate we made from Buffalo to New York was, less merely the rate you can get for the railroad.

Q. In the winter when navigation is closed on the Lakes your rates are increased, I suppose, from Chicago?—A. We can not increase them very much because of the water competition—of prices in Liverpool. The price in Liverpool really fixes the price that you can get for transportation. When I say Liverpool I mean the great centers of the world.

Q. Has the competition in St. Louis by way of Newport News and in St. Louis and Kansas City by way of the Gulf any effect on that?—A. Yes, a very serious effect. We now have to make the price practically from the Missouri River—

before, Chicago and St. Louis were the common centers. St. Louis maintained a higher rate of, we will say, 5 cents. I do not know whether it is 5 cents or not. On lower classes the rates from St. Louis were 5 cents higher going out than from Chicago. Of course, competition of the Gulf ports knocked that thing, because you can get a rate now from Kansas City to the Gulf about as cheap as you can get it from Chicago.

Q. Can you say whether that competition arising from the development of the grain business at Galveston, the grain business in New Orleans has affected the grain business in New York to any appreciable extent?—A. It has affected the earnings of the railroads. I think that they all make lower rates now than then.

Q. But the quantity of business, has that been affected materially, do you think?—A. I can not answer that question. It is very difficult because the crops vary so and conditions vary so. [IV, page 225.]

Statement of Mr. Samuel Spencer, president Southern Railway (Oct. 11, 1899):

In reply to a question concerning the effect of the development of the grain trade through Galveston and New Orleans upon the rates from Chicago to the Atlantic seaboard, which a previous witness testified had had a modifying effect on the rates from Chicago to the seaboard, Mr. Spencer said:

Well, I have no doubt that it has had some. My own impression is that the effect of it has been much exaggerated. [IV, page 276.]

Statement of Mr. Z. R. Carter, commission and produce merchant, Chicago, Ill. (Nov. 24, 1899):

Of course I know there have been years during the summer season when the rail rate has been cut very close to the water rate; other years it has not. The average rail rate for twenty years past, as I have learned during that length of time, has been much lower during the summer than during the winter. * * * I think it could be safely said, taking the average for twenty years, that it would be 25 per cent higher during the season of the closing of navigation than it would be during the season of water transportation. * * * The all-water transportation is now accomplished at a very great disadvantage owing to the fact that the Erie Canal is not improved up to date. [IV, page 578.]

Statement of Mr. Charles L. Keep, secretary of the Lake Carriers' Association and of the Buffalo Merchants' Exchange (Feb. 19, 1900):

The railroads do not make the differences that they formerly did in their rates between the season of navigation and the winter season. [IV, page 718.]

Statement of Martin A. Knapp, chairman Interstate Commerce Commission (Oct 5, 1899):

That railroad [Kansas City, Pittsburg and Gulf], in connection with the Mallory Steamship Line, which takes goods from New York to Galveston, after various intermediate reductions, finally put in a rate from New York City to Kansas City at 80 cents as against $1.47 by the all-rail lines, with the result that a very considerable amount of traffic moved by a circuitous route approximately 2½ times as long as the direct route, making, of course, higher rates from New York to St. Louis and from New York to Chicago, than from New York to Kansas City, a condition which, in a way, is illogical, and so, of course, can not permanently continue. I am not saying now whether the interested carriers were justified or not; that is not the point, but the effect, of course, was to bring about discriminating rates between the greatest trade centers of the country, because anyone can see that the rate from New York to Kansas City should not be lower than the rate from New York to St. Louis or from New York to Chicago. And yet during the last three or four months that has been the actual condition, that a very considerable amount of traffic has gone from New York to Kansas City, by way of Galveston, at a rate only a little more than half the standard rail rate from New York to that city.

Q. Can you say what conditions brought that about?—A. Well, I only know the excuse which, I understand, is put forward by the receivers of that road. They insist that they were entitled to what is known as a differential; that is, by reason of their circuitous route, the greater length of time which it would require to take traffic from New York to Kansas City by that route, the cost of marine insurance, and all that sort of thing, they could not get any of the business at the same rates as the all-rail lines; and therefore they ought to be allowed to charge somewhat less, with a view of

[illegible]

[illegible]

[illegible]

Q. (By Senator KYLE). On that one article alone?—A. Yes.

Q. How did they explain their extortionate charges before?—A. They do not try to make any explanations.

Q. (By Representative LIVINGSTON.) Do they not offer this explanation, that their train is made up at Chicago for the Pacific coast, and that they can haul through loads from Chicago on a much less tariff than they could stop at your place and take on additional cars and an additional amount?—A. Their chief explanation has always been water competition, but I have exploded that theory. They allege that water competition is the controlling factor. I recognize water competition as a controlling factor, but I deny that if the rate is 75 cents from New York, all rail overland to the Pacific coast, that Missouri River points should be given a 50-cent rate. The only argument I can see that they might advance is because of its proximity to the Pacific coast. But they also alleged that the ships did actually absorb the inland freights to the Atlantic coast and carried them around by the Horn. I then assumed that the railroads should raise their rates, add the 30 cents, if you please, that the ships absorbed, to the Missouri River rate of 75 cents and the New York rate, and that would make it $1.05 instead of 50 cents. And we proved at the hearing that they actually had 75 cents from New York and 50 cents at Omaha, but when you struck Denver it was $1.60 to Pacific coast points on the same articles. So your train making would apply to Missouri River points. It ought to affect them more seriously there than at Denver. There you understand they make it less.

Q. You can not ship by water at Denver?—A. No; not unless down the Platte River, and that is not very big.

Q. (By Mr. CONGER.) You are on water competition on the Missouri River practically?—A. They have had three steamboats. One burned up, and another sold out, and I do not know what became of the other. [IV, page 255.]

Statement of Mr. A. J. Vanlandingham, commissioner, St. Louis Traffic Bureau, on classifications (October 7, 1899):

One of the causes which has given the most trouble in my office for the past six months has been the desire of the railroads to secure business that did not legitimately belong to them. I had a condition on the Missouri River that will expire on the 15th of October, whereby rates from all points in the East, beginning with Portland, Me., on the north, and Norfolk on the south, extending as far west as Pittsburg and Buffalo to the Missouri River, by way of Galveston, and worked from Galveston on to Missouri River points, as low as rates from Chicago to the same points, as low as the rates from the same territory to St. Louis, when you count the bridge toll, added to our East St. Louis rate. That is in a way to be remedied now by order of the judge of the United States circuit court. The line that was making the rate being in the hands of a receiver, he decided the rate in effect from the eastern seaboard would be too low and ordered it advanced. If there had been no receiver, or if the receivers had not applied to the court for relief, I do not think we would have had any. [IV, page 202.]

The Southern is very largely an any-quantity classification, for the reason that I just gave—on account of water competition. * * * In the Pacific coast traffic there are nearly 1,500 exceptions to the classification, brought about by water classification [competition] around by the Pacific Mail and Cape Horn and other competition. [IV, page 203.]

Q. Does any of your traffic destined to Pacific seaboard points go to the Gulf and thence by water?—A. No; we have at times shipped from St. Louis to New York and thence by water. There is no direct transportation from the Gulf to the Pacific coast.

Q. How recent, as far as you know, have there been shipments from St. Louis to the Atlantic seaboard and thence around by water?—A. Within the last two years, up to the time of the rate war between what is known as the Clipper Line of steamers and the Pacific Mail, and the direct rail lines, went out of existence—that is, about a year and a half ago—we shipped lard and oleo oil and a number of commodities of that nature from Kansas City to the seaboard and thence by water to San Francisco.

Q. (By Mr. CLARKE.) Is it not true that the Southern Pacific Railroad has a line of steamers plying between Atlantic and Gulf ports and their eastern railroad termini at New Orleans and Galveston?—A. Yes; they own the Morgan Line. The Southern Pacific, on eastern seaboard business—I think it was shown in testimony some time ago—handled 65 per cent of all the eastern business by way of New Orleans to the Pacific coast points; that is, as far north as San Francisco.

Q. By reason of having that line of steamers?—A. Yes.

Q. They are able to make lower rates than the all-rail lines to the Pacific, aren't they?—A. The Southern Pacific so far have been able to dictate all the rates to the Pacific coast south of Portland, and up to May 1 last making, you might say, all the rates to the Pacific coast. [IV, page 207.]

[illegible]

[illegible]

[illegible]

Mr. KENNEDY. Does the community of interest between the railroads and steamship lines bring that about?—A. It is entirely community of interest; I can say "yes" to that, that competition between the coastwise lines and the railroad lines is more apparent than real.

Q. The community of interest, then, is likely to deprive the people of the advantage of the cheaper shipment by water?—A. Yes, it will certainly do that; has done it in fact. For instance, you would naturally suppose that the influence of the Lakes was of some significance, but every merchandise line on the Lakes is owned by the railroads. The same way with the Erie Canal, which runs from Buffalo to the Hudson River; there are merchandise freight lines owned by the railroads operating on the canal. [IX, 874, 875.]

RATES TO CALIFORNIA

Q. Is it possible for a New York merchant to do business in California territory in competition with San Francisco?—A. Yes. I was going to refer to the fact that on business destined for California and the Pacific coast there is another classification in effect which is peculiar to that traffic. It is made in a different way from the official or the western or southern. It is made by making groups, and naming rates to cover groups rather than items—that is, rather than separate items. There has been a contention by commercial bodies of the central West, particularly Chicago and St. Louis, that the scale of rates, and also the classification, in effect from Chicago and St. Louis was detrimental to their interests. Chicago and St. Louis claim that the transcontinental lines are using this same difference between the carload and less [lots] to exclude them from the Pacific coast territory. On the other hand, the Pacific coast jobbers maintain that Chicago and St. Louis have no right to do business out in their territory, and there is a case now before the Interstate Commerce Commission in which that whole question is involved. It is of a rather complicated nature. For instance, a rate from New York to San Francisco, and from Chicago to San Francisco, is the same. Chicago claims that because she is nearer San Francisco—and St. Louis makes a similar claim—the rate to San Francisco should be relatively less than it is from New York to San Francisco.

As a matter of fact the rate from New York to San Francisco on transcontinental business is what should be properly styled a compelled rate—that is, a rate that is not based on the cost of service rendered, or distance hauled, or anything of a similar nature. It is a compelled rate because it is fixed by the rate by ocean from New York around Cape Horn and up to San Francisco. The correct position, from a rate point of view, of Chicago to San Francisco is in reality the rate from Chicago to New York plus the rate from New York to San Francisco. What the interests of Chicago and St. Louis seek is to have that compelled rate used as a basis and then oblige the railroads to grade the rates from the eastern seaboard to the Pacific coast. * * *

Q. Does the city of Denver make a similar contention that it is entitled to still less than the Chicago-San Francisco rate?—A. Yes; there is one of the difficulties. If the principle involved that the compelled rate is not recognized and protected, and this graded system of rates is introduced, you can at once see that with the rate from New York to San Francisco $1 to begin with, to grade that westward, you would soon reach a point, perhaps after you left Denver, where there would not be any rate to decide. You would be carrying goods for nothing.

Q. Under present conditions, a jobbing merchant in Chicago can compete on even terms with one in New York in the whole California territory?—A. That is apparently true, but not wholly true, for this reason. The Chicago merchant has against him the rate that it originally cost him to get his stock from the east to Chicago, which must be added to that rate which he must pay from Chicago to San Francisco. [IX, 875, 876.]

Statement of Charles D. Griffith, representing the Denver Chamber of Commerce (May 8, 1901):

RATES TO SAN FRANCISCO

All the rates west of Chicago take the eastern basis of 67 cents, first class; all west of St. Louis take a basis of 87 cents to St. Louis, and west of the Missouri River I think it is $1.47. They all have this same basis and their rates are all the same to these points west of Denver. Kansas City, Omaha, St. Joseph, Chicago, St. Louis—all river points—the rates added from the Atlantic seaboard are the same.

COMMODITY RATES TO THE PACIFIC COAST

There are special rates made on certain items that have been brought before the Western Classification Committee, by which they were taken out of the class they were in and placed in a class of their own, a commodity, as they term it, having a special rate. [IX, 854.]

RIVER AND RAIL RATES

The accompanying tables of river rates and rail rates to points affected by river competition show that the water traffic materially affects the rail rates. Boat lines as a rule make lower rates than those made by rail carriers, but this is sometimes necessary on account of the cost of marine insurance and charges for storage and for loading and unloading. Insurance is less necessary on rail shipments because of the common-law liability of the rail carrier. Where goods are shipped from or delivered to a warehouse in a railroad switch, freight rates can be loaded or unloaded directly by the shipper, while boat freight has to be carried to and from the landing. On the other hand the boat lines sometimes have the advantage of economy in receiving and delivering freight from warehouses on the river banks.

On the upper Mississippi river rates are in many cases only two-thirds of the rail rate, and in some cases the difference is even greater, the rate from St. Paul to Alton, Ill., and St. Louis, Mo., for example, being 60 cents by rail and 40 cents by river for first-class freight.

The Chairman of Line reports as follows:

> We aim to always make our freight rates less than the railroads, and while we have no agreement with any railroad, we make our freight tariffs our based on a reduction of from 20 to 30% per cent less than the rail rates, for on account of the frequent service of the railroads and quicker time by rail, and also on account of the cost to shipper for marine insurance on shipments of freight, it is necessary to make considerably lower rates by river in order to secure a fair share of the business.

A circular issued by the Chairman of Line May 4, 1907, states that the merchandise rates from St. Louis are as follows:

> To all points in Kansas, Iowa, Nebraska, 20 per cent less than the rail rate. To Fairport, Fort Madison, and Burlington, Iowa, 15 per cent less than rail rate. To all points north of Burlington, Iowa, to and including St. Paul, 30 per cent less than rail rate.

Tables 97 and 98 (pages 304–306) compare river and rail rates from St. Louis and St. Paul to points on the upper Mississippi.

The effect of river competition is more clearly demonstrated by a comparison of rail rates from St. Louis to points on the Mississippi and points of equal distance on the Missouri, where there is no effective water competition, as shown in Table 99 (page 307) and Map I. It will be seen that rates to Kansas City, Leavenworth, St. Joseph, and Omaha are 60 cents per cwt. while to points on the Mississippi River of equal distance the rates range from 45 to 50 cents per cwt. On the single Missouri River line rates are approximately one-third lower than rail rates in Class I articles. Tables 100 and 101 (pages 308 and 309) show railroad freight rates from Missouri River points to St. Louis for a series of years.

On the Illinois River rates are in most cases lower than rail rates, as shown in Table 102 (page 310), but the difference between the rail and river rates is less than on the upper Mississippi. It is of interest to note that rates to Havana, Peoria, and Pekin are lower both by rail and river than to points where the distance is less.

On the lower Mississippi River the difference between the rail and river rates does not seem to be as great as on the upper Mississippi. Based on many cases the rates are the same by both routes, and in some cases, notably in the case of Louisiana intrastate rates, the river rates are even greater than the rail rates. The remaining results

in some cases also from the practice of the steamboat lines in charging the same rate to a large number of points. In some cases more prompt and convenient delivery can be had by river than by rail.

The tariff sheets of the Eagle Packet Company, operating from St. Louis to Commerce and Cape Girardeau, Mo., with intermediate landings, show rates which approximate closely to the rail rates. It is stated that shippers show a preference for the river route on account of the greater facility of delivery by the boats. In 1907, however, the Eagle Packet Company had a new competitor in the Cape Girardeau trade in the steamer *City of Memphis*, which inaugurated the policy of rate cutting, so that the Eagle Packet Company was unable to maintain the rates shown in its tariff sheets.

Officials of the St. Louis and Tennessee River Packet Company and of the Lee Line wrote the Secretary of the Business Men's League of St. Louis, in April, 1907, to the effect that there was no longer any through rate from St. Louis to New Orleans, either all water or water and rail. The superintendent of the Lee Line wrote:

> Four years ago we handled freight in connection with steamers at Memphis to Vicksburg, Miss., and connecting at Vicksburg with steamer for New Orleans, and the connecting lines at Memphis and Vicksburg found there was no money in the business when dividing the through rate with three lines, and at the closing of navigation in 1903 it was discontinued as it was not profitable for the three lines.

Tables 104, 105, 106, and 107 originally published by the Interstate Commerce Commission[a] show the rates on grain, flour, pork, meats, and hay carried by the river lines from St. Louis to the important river points south, to and including New Orleans.

Table 108 shows river and rail rates from St. Louis to New Orleans in effect in 1903.

The traffic manager of the St. Louis and Tennessee River Packet Company stated, in April, 1907, that it was impossible to make a combination rail and water rate from St. Louis to New Orleans, both being basing and competitive points. He added that if there were a through line of steamboats now operated between St. Louis and New Orleans, the class rates would, in his opinion, be as follows:

1.	2.	3.	4.	5.	6.	D.
Cts. 50	*Cts.* 40	*Cts.* 35	*Cts.* 30	*Cts.* 25	*Cts.* 20	*Cts.* 10

According to a letter from Mr. P. W. Coyle, commissioner, freight bureau of the Business Men's League of St. Louis, to Mr. W. F. Saunders, secretary and general manager of the Business Men's League, dated April 17, 1907, the all-rail class rates from St. Louis to New Orleans were the same as they were in 1903. Beer had been reduced 5 cents per 100 pounds, while lead pipe and sheet lead had been advanced 2 cents on both carload and less-than-carload lots. Bagging and ties may now be shipped in straight or mixed carloads, which was not permissible in 1903.

Mr. Coyle also states that, early in 1906 (Jan. 30), the St. Louis, Iron Mountain and Southern Railway advanced the rates from St.

[a] Railways in the United States in 1902, pp. 114-116.

Louis to about 15 station on the Memphis, Helena and Louisiana division. Concerning this advance Mr. Coyle writes:

> We set forth that water competition should be considered in the establishment of rates to points on this branch of the St. Louis, Iron Mountain and Southern Railway, which practically parallels the river, but we were informed that no boats were plying between St. Louis and the points in question. Boats were operated from Memphis, Vicksburg, Natchez, and New Orleans, hence the rates from those points remained unchanged.

The following table submitted by Mr. Coyle shows the old and new rates on the five classes and a number of commodities:

CLASS 1, 1923

From	1	2	3	4	5	Interest in—
St. Louis:	Cts.	Cts.	Cts.	Cts.	Cts.	
Old	20	17	15	13	9	Southern Classification.
Present	18	16	12	8	4	Western Classification.
Memphis	6	18	16	13	12	Do.
Natchez	6	18	16	13	12	Do.
New Orleans						

COMMODITY, 1923

	Old.	Present.
Wine, less than carloads	15	17
Agricultural implements, carloads	15	16
Axle grease, carloads	12	11
Dried beans, less than carloads	14	11
Beer, carloads	15	11
Candles, less than carloads	20	16
Crystal rock:		
Carloads	13	13
Less than carloads	17	12
Farm and dairy, less than carloads	13	15
Iron, less than carloads	12	15
Whisky in wood, less than carloads	14	14
Woodenware, carloads	11	13
Baking powder, less than carloads	14	15
Canned goods, less than carloads	14	13
Bottles, glass, less than carloads	14	11
Flour, less than carloads	12	13
Corn, less than carloads	15	13
Corn meal, less than carloads	13	14

An interesting comparison of all-rail rates applying to points in the rivers and those of inland points nearest of the river is shown by Map 1. It will be noted that the inland rates of the same distance as those nearest to the river are given higher rates than all-rail rates. Tables 110, 111, 112, 113 and 114 and Maps 2 and 4 showing class rates applying from Chicago, St. Louis, Louisville, Cincinnati, and Memphis, give a further comparison of such rates.

Table 114 shows river and rail rates from St. Louis to Tennessee River points.

The Ohio River from Pittsburg down is navigated by many packet and towing companies. Bulk traffic constitutes the greater tonnage of the river. Table 115 shows class rates applying from Pittsburg to points on the Ohio and Mississippi rivers.

The movement of iron from the Great Lakes down the Ohio River is an important factor. As the iron fleets are owned by the rail operators, there are no rates of freight. Table 116, however,

shows the effect of the water competition upon the rail lines operating from mines in West Virginia to points along the Ohio River. The rates to inland points of equal and even less distance are higher in proportion by from 30 to 40 cents per ton. Map 6, showing the all-rail rates on bituminous coal by the Chesapeake and Ohio Railway from the Kanawha district to points on the Ohio River and to interior Kentucky cities, clearly demonstrates the same effect.

Mr. Robert E. Lee, general manager of the Lee Line steamers, says:

> We try to get as near the railroad rates as possible, allowing for expense of insurance and expense for drayage when shipments originate from shippers who have tracks alongside their stores or factories, and small differential for hauling to and from the river on account of the steep grades of the levees, for which transfer companies charge extra.

The St. Louis and Tennessee River Packet Company claims to make its rates without considering any other lines, allowing circumstances to regulate them as facts and conditions warrant.

The Arkansas River Packet Company reports:

> In the majority of cases the rates of this line have to be made 50 per cent below rail rates, to which 50 per cent the charge for insurance and drayage can be added and still give a rate sufficiently attractive to bring traffic to the river. The "refund" system of the railroads (which really operates as a rebate) allows the shipper from 50 cents to $1.50 a bale back. This obtains where cotton is compressed en route and is the difference between the sum of the local rail rate to the compress plus the rate from compress to the point of destination and the through rate from point of origin to point of destination. Because of this refund the boats for several years could carry only flat (that is, uncompressed) cotton.

There is a considerable difference between the rail rates applying from New Orleans and Memphis to points on the river and to inland points in the adjacent country. First-class rates from New Orleans to Natchez, Vicksburg, Memphis, etc., are 45 cents; to interior points of equal and less distance the rates named are higher in every case.

Table 117 shows the all-rail rates applying from New Orleans to Mississippi River, Gulf and interior points in Mississippi, Louisiana, Alabama, and Tennessee. It will be seen from this table that the rail lines, in order to secure the traffic, charge a lower rate to the river points, and, in turn, charge a comparatively higher rate to points where there is no water transportation. This is further demonstrated on Maps Nos. 4 and 5, which cover the rates charged on Class 1 articles from Memphis, Tenn., and New Orleans, La., to river and inland points.

Contrary to the conditions on other river routes, the river rates from New Orleans to points in Louisiana are usually higher than the all-rail rates. It is asserted that the higher rates via river are accounted for by the fact that shipments by the boat lines make better time, which inclines the shipper to route via the boat lines. Table 118 of class rates applying from New Orleans to landings on the Mississippi River shows the relation of the rail and river rates.

The steamboat lines operating on the Red, Black, Ouachita, and tributary rivers do not go below the rail rates, and in some cases even quote higher rates than those of the rail lines from New Orleans. Apparently the same conditions exist as to points on the Mississippi in Louisiana. It is asserted that, owing to the greater certainty as to time of delivery by the river, the boat lines are in a position to name

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[illegible]

River. The rates to points on Gray's Harbor and Willapa Harbor on the Pacific coast are also lower than those to the intermediate cities of shorter distances.

Table 124 shows class rates applying from Portland to points on the Columbia River via rail and via river. It will be noted that the rail rates are higher in most cases, and in others meet the river rate. The first-class rate to Astoria and to The Dalles is 25 cents either by rail or river. To points just beyond The Dalles, where navigation is interrupted, the rail line takes advantage of the rehandling charges by the water route and names rates much in excess when distance is used as a basis of comparison.[a] The rate via rail to The Dalles, a distance of 87 miles, is 25 cents; to Castle Rock, a distance of 161 miles, the rate is 75 cents; in other words, the rate to Castle Rock is three times as high as the rate to The Dalles, while the distance is not quite twice as great.

The effect of water competition on the Columbia is further shown by a comparison of the rates applying from The Dalles, in Table 125. The rail rate to Portland, a distance of 87 miles, is 25 cents; to Castle Rock, a distance of 74 miles, the rate is 50 cents. The rate to Astoria, a distance of 187 miles, is 50 cents, while to Ainsworth and Pasco the rate is 90 cents on first-class freight.

It will be seen that where the river is navigated water competition is effective in lowering freight rates. The completion and opening of the work now in progress around the falls of Celilo will give an uninterrupted boat service from Lewiston to the sea.

Table 126 shows class rates applying from Portland to points on the Willamette and Yamhill rivers via rail and via river. The rates via river are lower than those by rail.

On Map 9 will be seen a demonstration of the effect of water competition in so far as freight rates are concerned. The rates to Puget Sound, Pacific Ocean, and Columbia River points are less than those to the intermediate and inland cities of approximately the same distances.

The Sacramento and the San Joaquin rivers, together with tributary rivers leading into San Francisco Bay, are navigated by several steamboat lines. The rail lines paralleling these waters or reaching points located on them are in constant competition with the water carriers. Table 127 and Map 8 give the rates from San Francisco to points on the various streams and to inland cities in the adjacent country, showing the comparatively low rates applying to points where steamboat traffic exists, while to points where the boat lines can not reach comparatively higher rates are in effect.

Loss of prorating arrangements with the railroads.—A representative of one of the packet lines on the Ohio states that up to about 1900, when the United States Steel Corporation was formed, Pittsburg boats had prorating arrangements with practically all the railroads tapping the Mississippi River, as well as the Ohio River, and reaching the South and West. At about the time mentioned they received verbal notices from all these railroads through their commercial

[a] There is a State Portage Railway 8 miles in length in operation since September, 1905, by means of which freight may be transferred from The Dalles to the head of Celilo Falls.

[illegible]

[illegible]

[illegible]

Prior to the building of the division of the "Frisco" Railway between St. Louis and Cape Girardeau, Mo., the Eagle Packet Company had prorating arrangements on much through business by way of the latter point, but since the line was completed the railroad has discontinued the prorating arrangements and the Packet Company can get no other arrangements with railroads at St. Louis.

The prorating between the Arkansas River Packet Company and the railroads was given up at the beginning of 1907. According to the packet company the railroads, after taking shipments of cotton for the East and for export, would cause delivery to be delayed after they had loaded it on cars from the boat line, and would hurry their own shipments to attract business to the railroads. The boat line had to pay the same rate as other local shippers.

Insurance.—The following illustration shows the effect of cargo insurance rates upon the packet lines. Referring to a proprietary medicine made in Pittsburg and having a large sale in the South, it is said:

Suppose the company has a shipment of 50 boxes to make, a shipment of this size weighing 2,000 pounds. The shipment is from Pittsburg to New Orleans. The rail rate on this is $1.05 per hundred pounds, or $21 for the lot. By the water lines, the through rate was originally 70 cents per hundred, or $14 for the shipment, making a difference of $7. The common-law liability of the railroad makes it practically an insurer of the freight, so the shipper has nothing extra to pay for that. By the river, however, the insurance on such a shipment would be $5.25, reducing the advantage of that route to $1.75 per ton of 50 boxes. This advantage was not sufficient for the river lines to hold the business and they were compelled to reduce their rate to 60 cents per hundred, and at this rate they held the business.

Another route on the shipment to New Orleans was by rail from Pittsburg to New York, and thence by steamship to New Orleans. The ocean line had an advantage in insurance rates, paying one-fourth of 1 per cent and the river line 1¼ per cent, the difference on the shipment of 50 boxes amounting to $4.20.

The following statement shows the cargo insurance rates for barges on the Ohio and Mississippi rivers:

Net insurance rates on straight lots of railroad iron, pig iron, blooms, and pig lead from Pittsburg, Pa.

Destination.	Class No. 1.	Class No. 2.	Class No. 3.
	Per cent.	*Per cent.*	*Per cent.*
Louisville	0.33⅓	0.40	0.50
Cairo	.50	.60	.75
Memphis	.60	.72	.90
St. Louis	.60	.72	.90
Vicksburg	.66⅔	.80	1.00
New Orleans	.83⅓	1.00	1.25

NOTE.—From other points in above proportion, as per tariff.

Net insurance rates on nails, bar iron, wire, plows, and cotton ties from Pittsburg, Pa.

Destination.	Class No. 1.	Class No. 2.	Class No. 3.
	Per cent.	*Per cent.*	*Per cent.*
Louisville	0.40	0.50	0.75
Cairo	.60	.75	1.00
Memphis	.72	.90	1.50
St. Louis	.72	.90	1.50
Vicksburg	.80	1.00	1.75
New Orleans	1.00	1.25	2.00

NOTE.—From other points in above proportion, as per tariff.

[illegible]

LAKE MICHIGAN
CHICAGO
100 MILES
100 MILES
100 MILES
100 MILES
100 MILES
100 MILES

[illegible]

[illegible]

TABLE 100—*Freight rates charged for the transportation of classified traffic and important commodities from Atchison, Kans., Kansas City, Mo., St. Joseph, Mo., and Leavenworth, Kans., to St. Louis, Mo., via rail lines, from January 2, 1877, to April 1, 1902*

[From Interstate Commerce Commission Report of Railways in the United States]

Date.	Classes and commodities.															
	Rates in cents per 100 pounds.													Rates per car.		
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Wheat.	Corn and oats.	Rye and barley.	Cattle.	Hogs.	Sheep.
1877—Jan. 2	60	45	30	25	....	....	....	....	....	....	25	17½	17½	$50.00	$50.00	$37.50
May 1	60	45	30	25	....	....	....	....	....	....	25	18	18	50.00	50.00	37.50
June 1	60	45	30	25	....	....	....	....	....	....	25	18½	18½	50.00	50.00	37.50
July 12	60	45	30	25	....	....	....	....	....	....	23	16	16	50.00	50.00	37.50
Aug. 20	60	45	30	25	....	....	....	....	....	....	25	20	20	50.00	50.00	37.50
Sept. 7	60	45	30	25	....	....	....	....	....	....	24	19	19	50.00	50.00	37.50
Oct. 19	60	45	30	24	....	....	....	....	....	....	24	19	19	50.00	50.00	37.50
Nov. 1	60	45	30	24	....	....	....	....	....	....	24	19	19	50.00	50.00	33.00
1878—Jan. 12	60	45	30	20	....	....	....	....	....	....	24	16	16	50.00	50.00	33.00
Jan. 14	60	45	30	20	....	....	....	....	....	....	20	16	16	50.00	50.00	33.00
May 6	60	45	30	20	....	....	....	....	....	....	20	15	15	50.00	50.00	33.00
July 25	60	45	30	20	....	....	....	....	....	....	20	15	15	50.00	40.00	30.00
Nov. 18	60	45	30	25	....	....	....	....	....	....	20	15	15	50.00	40.00	30.00
Nov. 27	60	45	30	25	....	....	....	....	....	....	20	15	15	45.00	30.00	30.00
1879—Feb. 1	60	45	30	25	....	....	....	....	....	....	20	15	15	50.00	40.00	30.00
Feb. 10	60	45	30	20	....	....	....	....	....	....	20	15	15	50.00	40.00	30.00
1880—Apr. 5[a]	60	45	30	20	20	20	20	15	22	20	20	15	15	50.00	40.00	30.00
Apr. 21	60	45	30	20	20	20	20	15	20	20	13	9	9	50.00	40.00	30.00
Apr. 24	60	45	30	20	20	20	20	15	20	20	10	7	7	50.00	40.00	30.00
Sept. 29	60	45	30	20	20	20	20	15	20	20	18	13	13	50.00	40.00	30.00
Oct. 27	60	45	30	20	20	20	20	15	20	20	20	15	15	50.00	40.00	30.00
Nov. 6	60	45	30	20	19	20	20	15	20	20	20	15	15	50.00	40.00	30.00
1881—Nov. 7	60	45	30	20	19	20	20	15	20	20	20	15	15	45.00	40.00	30.00
1882—Jan. 2	60	45	30	20	19	20	20	15	20	20	20	15	15	45.00	30.00	30.00
Feb. 1	60	45	30	20	19	20	20	15	20	20	17	15	15	45.00	30.00	30.00
Mar. 13	60	45	30	20	19	20	20	15	20	20	17	12½	12½	45.00	40.00	30.00
Apr. 1	60	45	30	20	19	20	20	15	20	20	20	15	15	47.50	40.00	30.00
Aug. 1	60	45	30	20	19	20	20	15	20	20	22½	17½	17½	47.50	40.00	30.00
Oct. 16	60	45	30	23	19	20	20	15	20	20	20	15	15	47.50	40.00	30.00
1883—Jan. 1	60	45	30	23	19	20	20	15	20	20	20	15	15	47.50	30.00	30.00
	1.	2.	3.	4.	5.	6.	A.	B.	C.	D.						
1883—May 15[a]	70	55	40	27	23	20	25	22	18	18	20	15	15	47.50	30.00	30.00
Nov. 12	70	55	40	27	23	20	25	22	18	18	20	15	15	47.50	32.50	30.00
Dec. 17	70	55	40	27	23	20	25	22	18	18	20	15	15	47.50	30.00	30.00
1884—June 2	70	55	40	30	25	20	25	22	18	18	20	15	15	47.50	30.00	30.00
June 16	70	55	40	30	25	20	25	22	18	18	20	15	15	47.50	30.00	25.00
1886—Aug. 23	70	55	40	30	25	20	25	22	18	18	20	15	15	47.50	30.00	25.00
1887—Jan. 1	70	55	40	30	25	20	25	22	18	18	20	15	15	47.50	30.00	25.00
	1.	2.	3.	4.	5.	A.	B.	C.	D.	E.						
1887—Apr. 5[a]	70	55	40	30	25	25	22	18	15	12	20	15	15	47.50	35.00	30.00
Aug. 1	70	55	40	30	25	25	22	18	15	12	17½	15	15	47.50	30.00	30.00
Dec. 20	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	42.50	30.00	30.00
1888—Jan. 9	55	40	30	25	20	22½	17½	10	10	10	17½	15	15	42.50	30.00	30.00
Mar. 26	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	42.50	30.00	30.00
Oct. 1	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	42.50	25.00	25.00
														In cents per 100 pounds.		
Oct. 25	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	18¾	15	20
1889—July 19	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	13½	21½	14½
Dec. 21	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	9½	21½	14½
1890—Jan. 30	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	7½	21½	14½
Aug. 25	55	40	30	25	20	22½	17½	15	12½	11	17½	15	15	18½	21½	21½
Oct. 1	55	40	30	25	20	22½	17½	15	12½	11	15	12	15	18½	21½	21½
1891—Jan. 15	55	40	30	25	20	22½	17½	15	12½	11	18	[b]14	15	18½	21½	21½
1892—Aug. 1	55	40	30	25	20	22½	17½	15	12½	11	18	[b]14	15	14½	15	17½
1893—June 10	55	40	32	25	20	22½	17½	15	12½	11	19	15	15	14½	15	17½
1894—May 12	55	40	32	25	20	22½	17½	15	12½	11	19	15	15	11½	8½	11½
June 1	55	40	32	25	20	22½	17½	15	12½	11	19	15	15	14½	15	17½
July 1	60	45	35	27	22	24½	19½	17	13½	11	19	15	15	20	18½	21½
1896—July 20	60	45	35	27	22	24½	19½	17	13½	11	12	9	9	20	18½	21½
July 26	60	45	35	27	22	24½	19½	17	13½	11	11	9	9	20	18½	21½
July 30	60	45	35	27	22	24½	19½	17	13½	11	8	6	6	20	18½	21½
Aug. 1	60	45	35	27	22	24½	19½	17	13½	11	12	10	10	20	18½	21½
Aug. 6	60	45	35	27	22	24½	19½	17	13½	11	13	11	11	20	18½	21½
Aug. 17	60	45	35	27	22	24½	19½	17	13½	11	12	10	10	20	18½	21½
Nov. 2	60	45	35	27	22	24½	19½	17	13½	11	14	10	10	20	18½	21½
1897—Apr. 8	60	45	35	27	22	24½	19½	17	13½	11	10	10	10	20	18½	21½

[a] New classification.

[b] Oats, 15 cents.

TABLE 100.—*Freight rates charged for the transportation of classified traffic and important commodities from Kansas City, Kans., Kansas City, Mo., St. Joseph, Mo., and Leavenworth, Kans., to St. Louis, Mo., via rail lines, from January 1, 187[illegible] to April 1, 1902.*—Continued.

Date.	Classes and commodities.																
	Rates in cents per 100 pounds.													Rates per car.		
	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	Wheat.	Other grain.	Other commodities.	Wheat.	Other grain.	Other commodities.
														Rates in cents per 100 pounds.		
1898—Jan.	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	20	34	21
Feb.	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	0	0	21
Mar.	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	4	34	21
Apr. 0	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	0	0	21
Sept. 27	0	45	35	17	12	24½	19½	7	23½	1	4	4	4	0	0	21
1899—Jan.	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	4	34	17
Mar. 2	0	45	35	17	12	24½	19½	7	23½	1	4	0	0	4	34	17
*1900—Jan.	0	45	35	17	12	24½	19½	7	23½	1	4	4	4	4	34	17
Mar. 4	0	45	35	17	12	24½	19½	7	23½	1	4	4	4	4	34	17
Aug. 6																
Aug. 1902	0	45	35	17	12	24½	19½	7	23½	1	4	1	1	4	34	17

TABLE 101.—*Freight rates charged for the transportation of grain and grain products from Kansas City, Mo., to St. Louis, Mo., from January 1, 187[illegible] to April 1, 1902.*

[From Interstate Commerce Commission's Report on Railways in the United States.]

Date.	Rates in cents per 100 pounds.			Date.	Rates in cents per 100 pounds.		
	Packing-house products.	Wheat.	Other grain.		Packing-house products.	Wheat.	Other grain.
1879—Jan. 7	25	25	25	1888—Mar. 26	25	17½	25
Feb.	25	25	25	Apr. 1	25	17½	25
Mar.	20	20	25	June 29	25	17½	25
Sept. 2	20	20	25	Oct.	25	17½	25
Oct. 1	20	20	25	Nov. 2	25	17½	25
Nov. 21	20	20	25	1889—Jan.	25	17½	25
Dec. 10	20	20	25	Mar. 25	25	17½	25
1880—Jan. 1	20	20	25	Apr. 19	25	17½	25
Jan. 21	20	20	25	June	25	17½	25
Jan. 24	20	20	25	1890—Mar. 1	25	17½	25
Dec. 1	20	20	25	Jan. 21	25	17½	25
1881—Jan.	20	20	25	Jan. 24	25	17½	25
Feb. 2	20	20	25	Apr.	25	17½	25
Dec. 20	20	20	25	1891—Jan.	25	17½	25
1882—Feb.	20	17½	25	Jan. 1	25	17½	25
Feb.	20	17½	25	1892—Mar. 9	25	17½	25
Mar. 1	20	17½	17½	1894—Dec.	25	17½	25
Jan.	20	20	25	1895—Mar. 1	25	17½	25
Nov. 27	20	20	25	Jan.	25	17½	25
Dec.	20	20	25	1896—Jan. 20	25	17½	25
1883—Jan.	20	20	25	Jan. 23	25	17½	25
Mar. 1	20	20	25	Jan. 29	25	17½	25
Mar. 1	20	20	25	Jan.	25	17½	25
Dec. 7	20	20	25	Jan.	25	17½	25
1884—Jan.	20	20	25	Jan. 7	25	17½	25
1885—Jan.	20	20	25	Feb. 10	25	17½	25
1886—Jan.	20	20	25	Nov.	25	17½	25
Jan. 22	17½	20	25	1897—Jan.	25	17½	25
Jan. 29	17½	20	25	Jan.	25	17½	25
1887—Jan.	17½	20	25	1898—Jan.	25	17½	25
Jan.	20	20	25	Jan.	25	17½	25
Jan.	20	20	25	Jan. 1	25	17½	25
Jan.	20	20	25	Jan. 23	25	17½	25
Jan.	20	20	25	Jan.	25	17½	25
Jan.	20	17½	25	Jan.	25	17½	25
Dec. 20	25	17½	25	Jan. 1	25	17½	25
1888—Jan.	25	17½	25	1899—Jan. 2	25	17½	25
Jan.	25	17½	25	Jan.	25	17½	25
Jan. 1	25	17½	25	1901—Jan.	25	17½	25
Jan. 1	25	17½	25	Jan.	25	17½	25
Jan. 27	25	17½	25	Jan. 1	25	17½	25
Mar.	25	17½	25	1902—Jan.	25	17½	25

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TABLE 104—*Highest and lowest freight rates, and the rate continuing for the longest period during each year, charged for the transportation of flour, pork, grain, meats, and hay from St. Louis, Mo., to Memphis, Tenn., Vicksburg, Miss., and New Orleans, La., via Mississippi River steamers, 1866–1906*

[Interstate Commerce Commission Report on Railways in the United States, as compiled from reports of St. Louis Merchants' Exchange]

Date.	Flour (per barrel).			Pork (per barrel).			Sack grain (per 100 pounds).			Meats (per 100 pounds).			Hay (per 100 pounds).		
	From St. Louis, Mo., to—														
	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1866—Highest	60	.....	150	125	.....	200	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	50	.....	40	75	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	50	.....	70	75	.....	100	.....	.....	.....	.....	.....	.....	.....	.....	.....
1867—Highest	.....	.....	150	.....	.....	250	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	.....	.....	40	.....	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868—Highest	.....	.....	100	.....	.....	175	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	.....	.....	20	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	.....	.....	40	.....	.....	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869—Highest	60	.....	75	100	.....	125	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	30	.....	30	50	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	30	.....	45	50	.....	70	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870—Highest	75	.....	125	125	.....	125	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	10	.....	35	40	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	50	.....	50	75	.....	90	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871—Highest	80	120	125	140	175	190	.....	.....	.....	.....	.....	.....	50	65	100
Lowest	25	30	25	40	45	40	.....	.....	.....	.....	.....	.....	25	25	25
Longest period	30	40	25	50	75	40	.....	.....	.....	.....	.....	.....	25	40	25
1872—Highest	75	110	125	110	175	190	.....	.....	.....	.....	.....	.....	45	75	75
Lowest	25	30	30	40	45	45	.....	.....	.....	.....	.....	.....	25	30	30
Longest period	30	40	40	50	65	60	.....	.....	.....	.....	.....	.....	40	40	35
1873—Highest	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	60
Lowest	.....	.....	25	.....	.....	37½	.....	.....	.....	.....	.....	.....	.....	.....	22½
Longest period	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	60
1874—Highest	.....	.....	70	.....	.....	105	.....	.....	.....	.....	.....	.....	.....	.....	40
Lowest	.....	.....	15	.....	.....	37½	.....	.....	.....	.....	.....	.....	.....	.....	17½
Longest period	.....	.....	35	.....	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	20
1875—Highest	80	80	75	120	125	108	.....	.....	.....	.....	.....	.....	40	40	40
Lowest	20	20	20	30	30	30	.....	.....	.....	.....	.....	.....	15	15	15
Longest period	25	40	40	60	75	60	.....	.....	.....	.....	.....	.....	20	25	25
1876—Highest	80	90	80	115	132	132	.....	.....	.....	40	45	40	43	48	45
Lowest	20	25	20	30	37½	30	.....	.....	.....	12½	12½	10	15	15	15
Longest period	25	35	35	37½	50	50	.....	.....	.....	17½	17½	17½	22½	22½	22½
1877—Highest	50	60	60	70	90	90	25	35	35	25	35	35	30	35	35
Lowest	25	40	30	37½	60	52½	12½	20	15	12½	20	15	17½	25	20
Longest period	30	40	40	45	60	60	15	20	20	15	20	20	20	25	25
1878—Highest	100	100	70	150	150	75	50	50	35	50	50	35	30	35	30
Lowest	15	20	20	30	30	30	7½	10	10	7½	10	10	15	15	15
Longest period	15	20	20	30	30	30	7½	10	10	7½	10	10	15	15	15
1879—Highest	45	70	60	60	105	90	20	35	30	20	35	30	25	40	35
Lowest	20	25	20	30	45	30	10	15	10	10	15	10	15	20	15
Longest period	25	35	25	37½	52½	37½	12½	17½	12½	12½	17½	12½	17½	22½	17½
1880—Highest	45	60	50	60	90	75	51	30	25	20	30	25	25	35	30
Lowest	25	40	30	30	60	45	12½	20	15	15	20	15	17½	25	20
Longest period	40	40	30	60	60	45	20	20	15	20	20	15	25	25	20
1881—Highest	45	60	50	67½	90	75	22½	30	25	22½	30	25	27½	35	32½
Lowest	30	40	30	45	60	45	15	20	15	15	20	15	20	25	20
Longest period	30	60	45	45	90	67½	15	30	22½	17½	30	22½	20	35	27½
1882—Highest	35	60	50	52½	90	75	17½	30	25	17½	.....	.....	22½	35	30
Lowest	25	40	40	45	60	60	12½	20	20	15	.....	.....	17½	25	25
Longest period	25	40	40	45	60	60	12½	20	20	15	.....	.....	17½	25	25
1883—Highest	35	50	45	52½	75	67½	17½	25	22½	17½	25	22½	22½	30	27½
Lowest	25	40	25	37½	60	37½	12½	20	12½	12½	20	12½	17½	25	17½
Longest period	25	40	30	37½	75	60	12½	25	20	12½	25	20	17½	30	25
1884—Highest	30	45	45	35	67½	52½	15	22½	17½	15	22½	17½	20	27½	22½
Lowest	25	40	40	25	60	37½	13	20	12½	13	20	12½	17½	25	17½
Longest period	25	40	40	25	60	37½	13	20	12½	13	20	12½	18	25	17½
1885—Highest	30	45	35	45	67½	52½	15	22½	17½	15	22½	17½	17½	27½	22½
Lowest	30	45	30	45	67½	45	15	22½	15	15	22½	15	17½	27½	20
Longest period	30	45	35	45	67½	52½	15	22½	17½	15	22½	17½	17½	27½	22½

TABLE 116.—Highest and lowest freight rates, and the rate continuing for the longer period during each year, charged for the transportation of four articles, namely, grain, meats, and hay, from St. Louis, Mo., to Memphis, Tenn., Vicksburg, Miss., and New Orleans, La., via Mississippi River routes, 1886–1906—4 months.

Date.	Flour (per barrel)			Pork (per barrel)			Corn-grain (per 100 pounds)			Meats (per 100 pounds)			Hay (per 100 pounds)		
	From St. Louis, Mo., to														
	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.
	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.	Cts.
1886—Highest	20	40	35	40	40	50	5	5	5	15	15	15	25	25	25
Lowest	20	35	30	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	24	35	35	30	30	30	3	3	3	12	12	12	15	15	15
1887—Highest	40	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	40	35	20	40	30	4	3	3	12	12	12	15	15	15
1888—Highest	20	40	35	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1889—Highest	30	40	40	30	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	40	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	23	40	35	20	20	20	3	3	3	12	12	12	15	15	15
1890—Highest	30	40	35	30	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	40	35	20	20	20	3	3	3	12	12	12	15	15	15
1891—Highest	40	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	30	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	30	20	20	20	3	3	3	12	12	12	15	15	15
1892—Highest	40	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	30	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1893—Highest	20	35	35	20	20	20	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1894—Highest	20	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1895—Highest	20	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1896—Highest	20	40	40	40	40	40	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1897—Highest	20	35	35	20	20	20	5	5	5	15	15	15	25	25	25
Lowest	20	35	35	20	20	20	2½	2½	2½	10	10	10	15	15	15
Average rate for the year	20	35	35	20	20	20	3	3	3	12	12	12	15	15	15
1898—Highest			20			20			5				20		
Lowest			20			20			2½				20		
Average rate for the year			20			20			3				20		
1899—Highest			20			20			5				20		
Lowest			20			20			2½				20		
Average rate for the year			20			20			3				20		
1900—Highest			20			20			5				20		
Lowest			20			20			2½				20		
Average rate for the year			20			20			3				20		
1901—Highest			20			20			5				20		
Lowest			20			20			2½				20		
Average rate for the year			20			20			3				20		
1902—Highest	20	20	20			20	20	20	5	20	20	20	20	20	5
Lowest	20	20	20			20	20	20	2½	20	20	20	20	20	5
Average rate for the year	20	20	20			20	20	20	3	20	20	20	20	20	5
1905–1906	20	20											20	20	

[1] Flour and meal. [2] Per 10 pounds. [3] Meal, 2 sacks, per 10 pounds.

TABLE 105—*Average freight rates charged for the transportation of grain in sacks, via steamers, and wheat, corn, and rye, via barges, from St. Louis, Mo., to New Orleans, La., 1866–1903*

[Compiled from reports of St. Louis Merchants' Exchange]

Year.	Grain in sacks (per 100 pounds).	Wheat in bulk (per bushel).	Corn and rye (per bushel).		Year.	Grain in sacks (per 100 pounds).	Wheat in bulk (per bushel).	Corn and rye (per bushel).	
			High water.	Low water.				High water.	Low water.
	Cents.	*Cents.*	*Cents.*	*Cents.*		*Cents.*	*Cents.*	*Cents.*	*Cents.*
1866			12⅜	15⅜	1885	15	6¾	5	7
1867			15½	20½	1886	16	6¾	5	7
1868			8 7/16	13¾	1887	18¼	6¾	5	7
1869			8¾	11⅛	1888	15	6¾	5	7½
1870			10¾	15 7/16	1889	17.93	5.95	5	7
1871			7½	18⅜	1890	15.66	6.58	5	7
1872			11	21⅜	1891	16.28	6.88	5	7½
1873			7	11	1892	16.87	6.50	5	7
1874			5½	9	1893	17.54	6.55		
1875			5¾	11½	1894	17.14	5.89		
1876			5⅜	12¾	1895	12.50	5.95		
1877	21	8½	8	9	1896	14.55	5		
1878	17½	7¼	5	9	1897	15	4.98		
1879	18	7¾	5	11	1898	10	4.50		
1880	19	8¼	7	9½	1899	10	4.50		
1881	20	6	4	8	1900	10	4.25		
1882	20	6 5/16	5½	7	1901	10	4.25		
1883	17¾	5¾	5	7	1902	10	4.20		
1884	14	6⅛	5	7	1903	10	5		

TABLE 106—*Freight rates charged for the transportation of flour, pork, grain, and hay by barge and river from St. Louis, Mo., to New Orleans, La., 1887–1904*

[From St. Louis Merchants Exchange Reports]

Year.	Flour and meal.	Pork.	Sacked grain and meats.	Hay.
	Per bbl.	*Per 100 lbs.*	*Per 100 lbs.*	*Per 100 lbs.*
1887	30 to 40	45 to 60	15 to 20	20 to 22½
1888	25 to 35	37½ to 52½	12½ to 17½	17½ to 20
1889	35 to 40	52½ to 60	17½ to 20	20
1890	30 to 35	45 to 52½	15 to 17½	17½ to 20
1891	30 to 40	45 to 60	15 to 20	17½ to 22½
1892	30 to 40	45 to 60	15 to 20	17½ to 22½
1893	30 to 35	45 to 52½	15 to 17½	20
1894	25 to 40	37½ to 60	12½ to 20	17½ to 20
1895	20 to 40	30 to 60	10 to 20	12½ to 20
1896	30	45	15	17½
1897	30	45	15	17½
		Per bbl.		
1898	20	10	10	12½
1899	20	10	10	15
1900	20	10	10	15
1901	20	10	10	15
1902	20	10	10	15
1903	20	10	10	15
1904				

TABLE 103—*Freight rates charged for the transportation of articles classed in the Illinois, Western and Southern Classifications via rail and via river from St. Louis, Mo., to points on the lower Mississippi River*

[In effect September 1, 1907]

	Classes, in cents per 100 pounds.																			Per bbl.
Illinois Classification Western Classification Southern Classification			1		2		3		4		5		6 A 6	7 B A	8 C B	9 D C	10 E D			
To—	By rail.	By river. (a)	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	All rail.	All rail.	All rail.	All rail.	All rail.	All rail.	All rail.
	Miles.	*Miles.*																		
Carondelet, Mo. *b*			15.0		12.0		10.0		9.0		2.0		2.0	2.0	2.0	2.0	2.0			
Kimmswick, Mo. *b*		22	19.0		16.0		14.0		11.0		8.0		9.5	7.0	6.0	5.5	4.0			
Festus, Mo. *b*			20.0		17.0		14.0		11.0		9.0		10.0	7.0	6.5	6.5	5.0			
Ste. Genevieve, Mo. *b*	65	60	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.0	11.0	8.0	6.5	6.0			
Chester, Ill. *c*	69	80	29.3	25	24.8	20	20.9	15	14.8	12.5	12.2	10	11.4	11.0	9.2	7.5	6.8			
Claryville, Mo. *b*		80		25		20		15		12.5		10								
Seventysix, Mo. *b*	96	107	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.5	12.5	10.0	8.0	7.0			
Wittenberg, Mo. *b*	103	118	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.5	12.5	10.0	8.0	7.0			
Grand Tower, Ill. *c*		120		25		20		15		12.5		10								
Neelys, Mo. *b*	115	130	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.5	12.5	10.0	8.0	7.0			
Bainbridge, Mo. *b*	122	139	25.0		20.0		15.0		12.5		12.5		12.5	12.5	10.0	8.0	7.0			
Cape Girardeau, Mo. *b*	131	150	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.5	12.5	10.0	8.0	7.0			
Thebes, Ill. *c*	129	160	35.2	25	27.7	20	22.	15	17.5	12.5	14.2	10	13.2	12.4	10.2	8.3	7.5			
Commerce, Mo. *b*		165	25.0	25	20.0	20	15.0	15	12.5	12.5	12.5	10	12.5	12.5	10.0	8.0	7.0			
Cairo, Ill. *c*	154	200	37.1		29.6		23.2		19.1		15.4		14.1	13.1	11.1	8.9	8.1			
Wickliffe, Ky. *d*			40.0		30.0		25.0		18.0		18.0		15.0	15.0	15.0	15.0	12.0	15.0	15.0	30.0
Columbus, Ky. *d*		221	40.0		30.0		25.0		18.0		18.0		15.0	15.0	15.0	15.0	12.0	15.0	15.0	30.0
Caruthersville, Mo. *b*	220	310	60.0		45.0		40.0		35.0		28.0		28.0	23.0	19.0	16.0	12.0			
Memphis, Tenn. *d*	305	430	65.0		50.0		45.0		35.0		30.0		25.0	15.0	15.0	15.0	12.0	20.0	42.0	30.0
Helena, Ark. *d*		506	90.0		75.0		65.0		50.0		40.0		35.0	25.0	25.0	22.5	20.0	28.0	57.0	45.0
Greenville, Miss. *d*		678	90.0		75.0		65.0		50.0		40.0		35.0	25.0	25.0	22.5	20.0	28.0	57.0	45.0
Vicksburg, Miss. *d*		799	90.0		75.0		65.0		50.0		40.0		35.0	25.0	25.0	22.5	20.0	28.0	57.0	45.0
Natchez, Miss. *d*		898	90.0		75.0		65.0		50.0		40.0		35.0	25.0	25.0	22.5	20.0	28.0	57.0	45.0
New Orleans, La. *d*		1,161	90.0		75.0		65.0		50.0		40.0		35.0	25.0	25.0	22.5	20.0	28.0	57.0	45.0

a River mileage from Census Report 1890, Transportation by Water
b Governed by the Western Classification.
c Governed by the Illinois Classification.
d Governed by the Southern Classification.

TABLE 104—*Highest and lowest freight rates, and the rate continuing for the longest period during each year, charged for the transportation of flour, pork, grain, meats, and hay from St. Louis, Mo., to Memphis, Tenn., Vicksburg, Miss., and New Orleans, La., via Mississippi River steamers, 1866–1906*

[Interstate Commerce Commission Report on Railways in the United States, as compiled from reports of St. Louis Merchants' Exchange]

Date.	Flour (per barrel).			Pork (per barrel).			Sack grain (per 100 pounds).			Meats (per 100 pounds).			Hay (per 100 pounds).		
	From St. Louis, Mo., to—														
	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.	Memphis, Tenn.	Vicksburg, Miss.	New Orleans, La.
	Cts.	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*	*Cts.*
1866—Highest	60	.....	150	125	.....	200	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	50	.....	40	75	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	50	.....	70	75	.....	100	.....	.....	.....	.....	.....	.....	.....	.....	.....
1867—Highest	.....	.....	150	.....	.....	250	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	.....	.....	40	.....	.....	60	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	.....
1868—Highest	.....	.....	100	.....	.....	175	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	.....	.....	20	.....	.....	40	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	.....	.....	40	.....	.....	65	.....	.....	.....	.....	.....	.....	.....	.....	.....
1869—Highest	60	.....	75	100	.....	125	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	30	.....	30	50	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	30	.....	45	50	.....	70	.....	.....	.....	.....	.....	.....	.....	.....	.....
1870—Highest	75	.....	125	125	.....	125	.....	.....	.....	.....	.....	.....	.....	.....	.....
Lowest	10	.....	35	40	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	.....
Longest period	50	.....	50	75	.....	90	.....	.....	.....	.....	.....	.....	.....	.....	.....
1871—Highest	80	120	125	140	175	190	.....	.....	.....	.....	.....	.....	50	65	100
Lowest	25	30	25	40	45	40	.....	.....	.....	.....	.....	.....	25	25	25
Longest period	30	40	25	50	75	40	.....	.....	.....	.....	.....	.....	25	40	25
1872—Highest	75	110	125	110	175	190	.....	.....	.....	.....	.....	.....	45	75	75
Lowest	25	30	30	40	45	45	.....	.....	.....	.....	.....	.....	25	30	30
Longest period	30	40	40	50	65	60	.....	.....	.....	.....	.....	.....	40	40	35
1873—Highest	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	60
Lowest	.....	.....	25	.....	.....	37½	.....	.....	.....	.....	.....	.....	.....	.....	22½
Longest period	.....	.....	100	.....	.....	150	.....	.....	.....	.....	.....	.....	.....	.....	60
1874—Highest	.....	.....	70	.....	.....	105	.....	.....	.....	.....	.....	.....	.....	.....	40
Lowest	.....	.....	15	.....	.....	37½	.....	.....	.....	.....	.....	.....	.....	.....	17½
Longest period	.....	.....	35	.....	.....	50	.....	.....	.....	.....	.....	.....	.....	.....	20
1875—Highest	80	80	75	120	125	108	.....	.....	.....	.....	.....	.....	40	40	40
Lowest	20	20	20	30	30	30	.....	.....	.....	.....	.....	.....	15	15	15
Longest period	25	40	40	60	75	60	.....	.....	.....	.....	.....	.....	20	25	25
1876—Highest	80	90	80	115	132	132	.....	.....	.....	40	45	40	43	48	45
Lowest	20	25	20	30	37½	30	.....	.....	.....	12½	12½	10	15	15	15
Longest period	25	35	35	37½	50	50	.....	.....	.....	17½	17½	17½	22½	22½	22½
1877—Highest	50	60	60	70	90	90	25	35	35	25	35	35	30	35	35
Lowest	25	40	30	37½	60	52½	12½	20	15	12½	20	15	17½	25	20
Longest period	30	40	40	45	60	60	15	20	20	15	20	20	20	25	25
1878—Highest	100	100	70	150	150	75	50	50	35	50	50	35	30	35	30
Lowest	15	20	20	30	30	30	7½	10	10	7½	10	10	15	15	15
Longest period	15	20	20	30	30	30	7½	10	10	7½	10	10	15	15	15
1879—Highest	45	70	60	60	105	90	20	35	30	20	35	30	25	40	35
Lowest	20	25	20	30	45	30	10	15	10	10	15	10	15	20	15
Longest period	25	35	25	37½	52½	37½	12½	17½	12½	12½	17½	12½	17½	22½	17½
1880—Highest	45	60	50	60	90	75	51	30	25	20	30	25	25	35	30
Lowest	25	40	30	30	60	45	12½	20	15	15	20	15	17½	25	20
Longest period	40	40	30	60	60	45	20	20	15	20	20	15	25	25	20
1881—Highest	45	60	50	67½	90	75	22½	30	25	22½	30	25	27½	35	32½
Lowest	30	40	30	45	60	45	15	20	15	15	20	15	20	25	20
Longest period	30	60	45	45	90	67½	15	30	22½	17½	30	22½	20	35	27½
1882—Highest	35	60	50	52½	90	75	17½	30	25	17½	.....	.....	22½	35	30
Lowest	25	40	40	45	60	60	12½	20	20	15	.....	.....	17½	25	25
Longest period	25	40	40	45	60	60	12½	20	20	15	.....	.....	17½	25	25
1883—Highest	35	50	45	52½	75	67½	17½	25	22½	17½	25	22½	22½	30	27½
Lowest	25	40	25	37½	60	37½	12½	20	12½	12½	20	12½	17½	25	17½
Longest period	25	40	30	37½	75	60	12½	25	20	12½	25	20	17½	30	25
1884—Highest	30	45	45	35	67½	52½	15	22½	17½	15	22½	17½	20	27½	22½
Lowest	25	40	40	25	60	37½	13	20	12½	13	20	12½	17½	25	17½
Longest period	25	40	40	25	60	37½	13	20	12½	13	20	12½	18	25	17½
1885—Highest	30	45	35	45	67½	52½	15	22½	17½	15	22½	17½	17½	27½	22½
Lowest	30	45	30	45	67½	45	15	22½	15	15	22½	15	17½	27½	20
Longest period	30	45	35	45	67½	52½	15	22½	17½	15	22½	17½	17½	27½	22½

TABLE 105—*Average freight rates charged for the transportation of grain in sacks, via steamers, and wheat, corn, and rye, via barges, from St. Louis, Mo., to New Orleans, La., 1866–1903*

[Compiled from reports of St. Louis Merchants' Exchange]

Year.	Grain in sacks (per 100 pounds).	Wheat in bulk (per bushel).	Corn and rye (per bushel).		Year.	Grain in sacks (per 100 pounds).	Wheat in bulk (per bushel).	Corn and rye (per bushel).	
			High water.	Low water.				High water.	Low water.
	Cents.	*Cents.*	*Cents.*	*Cents.*		*Cents.*	*Cents.*	*Cents.*	*Cents.*
1866			12¾	15⅜	1885	15	6⅜	5	7
1867			15½	20½	1886	16	6¼	5	7
1868			8 7/16	13¾	1887	18¼	6⅜	5	7
1869			8⅜	11⅛	1888	15	6½	5	7½
1870			10⅜	15 7/16	1889	17.93	5.95	5	7
1871			7½	18⅛	1890	15.66	6.58	5	7
1872			11	21⅜	1891	16.28	6.88	5	7½
1873			7	11	1892	16.87	6.50	5	7
1874			5½	9	1893	17.54	6.55		
1875			5⅜	11½	1894	17.14	5.89		
1876			5⅜	12⅜	1895	12.50	5.95		
1877	21	8½	8	9	1896	14.55	5		
1878	17½	7¼	5	9	1897	15	4.98		
1879	18	7¾	5	11	1898	10	4.50		
1880	19	8¼	7	9½	1899	10	4.50		
1881	20	6	4	8	1900	10	4.25		
1882	20	6 5/8	5½	7	1901	10	4.25		
1883	17¾	5½	5	7	1902	10	4.20		
1884	14	6⅜	5	7	1903	10	5		

TABLE 106—*Freight rates charged for the transportation of flour, pork, grain, and hay by barge and river from St. Louis, Mo., to New Orleans, La., 1887–1904*

[From St. Louis Merchants Exchange Reports]

Year.	Flour and meal.	Pork.	Sacked grain and meats.	Hay.
	Per bbl.	*Per 100 lbs.*	*Per 100 lbs.*	*Per 100 lbs.*
1887	30 to 40	45 to 60	15 to 20	20 to 22½
1888	25 to 35	37½ to 52½	12½ to 17½	17½ to 20
1889	35 to 40	52½ to 60	17½ to 20	20
1890	30 to 35	45 to 52½	15 to 17½	17½ to 20
1891	30 to 40	45 to 60	15 to 20	17½ to 22½
1892	30 to 40	45 to 60	15 to 20	17½ to 22½
1893	30 to 35	45 to 52½	15 to 17½	20
1894	25 to 40	37½ to 60	12½ to 20	17½ to 20
1895	20 to 40	30 to 60	10 to 20	12½ to 20
1896	30	45	15	17½
1897	30	45	15	17½
		Per bbl.		
1898	20	10	10	12½
1899	20	10	10	15
1900	20	10	10	15
1901	20	10	10	15
1902	20	10	10	15
1903	20	10	10	15
1904				

TABLE 107—*Freight rates charged for the transportation of wheat and other grain via all rail from St. Louis, Mo., to New Orleans, La., and Vicksburg, Miss., 1887–1907*

Year.	Date.	Flat rate per 100 pounds.		Proportional rate per 100 pounds.		Flat rate per bushel, wheat.	Proportional rate per bushel, wheat.
		Wheat.	Other grain.	Wheat.	Other grain.		
		Cents.	*Cents.*	*Cents.*	*Cents.*	*Cents.*	*Cents.*
1887..	Apr. 25 to Aug. 1	21½	21½	.....	.....	12.90	.....
1887..	Aug. 1 to Dec. 31	20	20	.....	.....	12.00	.....
1888..	Jan. 1 to Oct. 15	20	20	.....	.....	12.00	.....
1888..	Oct. 15 to 26	18	18	.....	.....	10.80	.....
1888..	Oct. 15 to Dec. 31	20	20	.....	.....	12.00	.....
1889..	All year	20	20	.....	.....	12.00	.....
1890..	.....do	20	20	.....	.....	12.00	.....
1891..	.....do	20	20	.....	.....	12.00	.....
1892..	.....do	20	20	.....	.....	12.00	.....
1893..	.....do	20	20	.....	.....	12.00	.....
1894..	.....do	20	20	.....	.....	12.00	.....
1895..	.....do	20	20	.....	.....	12.00	.....
1896..	.....do	20	20	15	15	12.00	9.00
1897..	.....do	20	20	15	15	12.00	9.00
1898..	.....do	20	20	15	15	12.00	9.00
1899..	Jan. 1 to May 13	20	20	15	15	12.00	9.00
1899..	May 13 to Dec. 31	20	20	14½	12½	12.00	7.50
1900..	Jan. 1 to Apr. 14	20	20	14½	12½	12.00	7.50
1900..	Apr. 14 to Dec. 31	20	20	.....	.....	12.00	.....
1901..	Jan. 1 to 14	20	20	.....	.....	12.00	.....
1901..	Jan. 14 to Dec. 31	17	15	.....	.....	9.00	.....
1902..	Jan. 1 to Sept. 10	17	15	.....	.....	9.00	.....
1902..	Sept. 10 to Dec. 31	17	15	.....	12	9.00	7.20
1903..	All year	17	15	.....	.....	9.00	.....
1904..	.....do	17	15	.....	.....	9.00	.....
1905..	Jan. 1 to May 31	17	15	.....	.....	9.00	.....
1905..	May 1 to Dec. 1	17	15	[a] 13	11	9.00	6.60
1906..	All year	17	15	[a] 13	11	9.00	6.60
1907..	Jan. 1 to date	17	15	[a] 13	11	9.00	6.60

[a] On wheat to New Orleans only. Can not get record of proportional or reconsigned rates back of 1896. It is quite possible that such rates existed prior to that time and always something less than the "flat" rates. It is a fact that where reconsigned rates are in effect practically all grain moves on such rates.

TABLE 111—*Freight rates charged for the transportation of classified traffic (governed by the Southern Classification) via all rail from Louisville, Ky., to Mississippi River and southern interior points, in effect July 1, 1907*

To—	Distance.	Classes, in cents per 100 pounds.												
		1.	2.	3.	4.	5.	6.	A.	B.	C.	D.	E.	H.	F.
MISSISSIPPI RIVER POINTS.	*Miles.*													*Per bbl.*
Cairo, Ill.														
Memphis, Tenn.		65	50	45	35	30	25	15	15	[a]15	12	20	42	30
Helena, Ark.														
Greenville, Miss.														
Vicksburg, Miss.														
Natchez, Miss.		90	75	65	50	40	35	25	25	[a]22½	20	28	57	45
Baton Rouge, La.														
New Orleans, La.														
Mobile, Ala.														
INTERIOR CITIES.														
Clarksville, Tenn.		41	36	31	26	21	18	18	18	14	13	18	24	26
Nashville, Tenn.		38	33	28	23	18	15	15	15	11	10	15	21	20
Jackson, Tenn.		86	74	62	50	35	33	34	34	25½	20	29	37	51
Chattanooga, Tenn.		76	65	57	47	40	30	20	26	23	19	34	39	38
Holly Springs, Miss.		98	82	69	57	45	39	32	31	25½	22	39	51	51
Winona, Miss.		114	94	74	63	51	43	36	38	26	23	40	55	52
Columbus, Miss.		114	94	74	63	51	43	38	41	27	25	40	55	54
Jackson, Miss.		98	84	70	59	49	43	35	32½	27	25	34	55	54
Meridian, Miss.		98	84	70	59	49	43	35	32½	27	25	34	55	54
Hattiesburg, Miss.		118	101	85	71	58	49	40	37½	39	30	46	67	65
Huntsville, Ala.		79	69	58	47	40	30	23	26	23	19	34	33	38
Birmingham, Ala.		79	69	58	47	40	30	28	31	24	20	39	39	40
Montgomery, Ala.		98	87	78	63	52	41	28	31	24	20	48	39	40
Troy, Ala.		136	116	102	87	73	58	43	44	34	29	69	65	59

[a] Applies on flour, in sacks, less carload.

TABLE 112—*Freight rates charged for the transportation of classified traffic (governed by the Southern Classification) via all rail from Cincinnati, Ohio, to Mississippi River and southern interior points, in effect July 1, 1907*

To—	Distance.	Classes, in cents per 100 pounds.												
		1.	2.	3.	4.	5.	6.	A.	B.	C.	D.	E.	H.	F.
MISSISSIPPI RIVER POINTS.	*Miles.*													*Per bbl.*
Cairo, Ill.														
Memphis, Tenn.		75	60	55	40	35	30	20	19	20	17	24	49	40
Helena, Ark.														
Greenville, Miss.														
Vicksburg, Miss.														
Natchez, Miss.		98	83	73	54	44	39	28	27	[a]24½	22	31	61	49
Baton Rouge, La.														
New Orleans, La.														
Mobile, Ala.														
INTERIOR CITIES.														
Clarksville, Tenn.		53	48	39	31	25	25	25	23	18	17½	20	28	34
Nashville, Tenn.		53	48	39	31	25	25	25	23	18	17½	20	28	34
Jackson, Tenn.		99	85	70	57	41	38	38	40	28½	23	33	41	57
Chattanooga, Tenn.		76	65	57	47	40	30	20	26	23	19	34	39	38
Holly Springs, Miss.		107	92	77	63	51	44	37	35	30½	25	43	55	61
Winona, Miss.		123	102	82	70	57	48	40	42	31	26	44	59	62
Columbus, Miss.		123	102	82	70	57	48	42	46	32	28	44	59	64
Jackson, Miss.		106	92	78	66	55	48	39	34½	29	27	38	59	58
Meridian, Miss.		106	92	78	66	55	48	39	34½	29	27	38	59	58
Hattiesburg, Miss.		126	109	93	75	62	53	43	39½	41	32	49	71	69
Huntsville, Ala.		79	69	58	47	40	30	23	26	23	19	34	33	38
Birmingham, Ala.		89	79	68	55	47	36	32	33	26	22	43	43	44
Montgomery, Ala.		108	97	88	71	59	47	32	33	26	22	52	43	44
Troy, Ala.		146	126	112	95	80	64	47	46	36	31	73	69	63

[a] Applies on flour, in sacks, less carloads.

MAP NO. 3

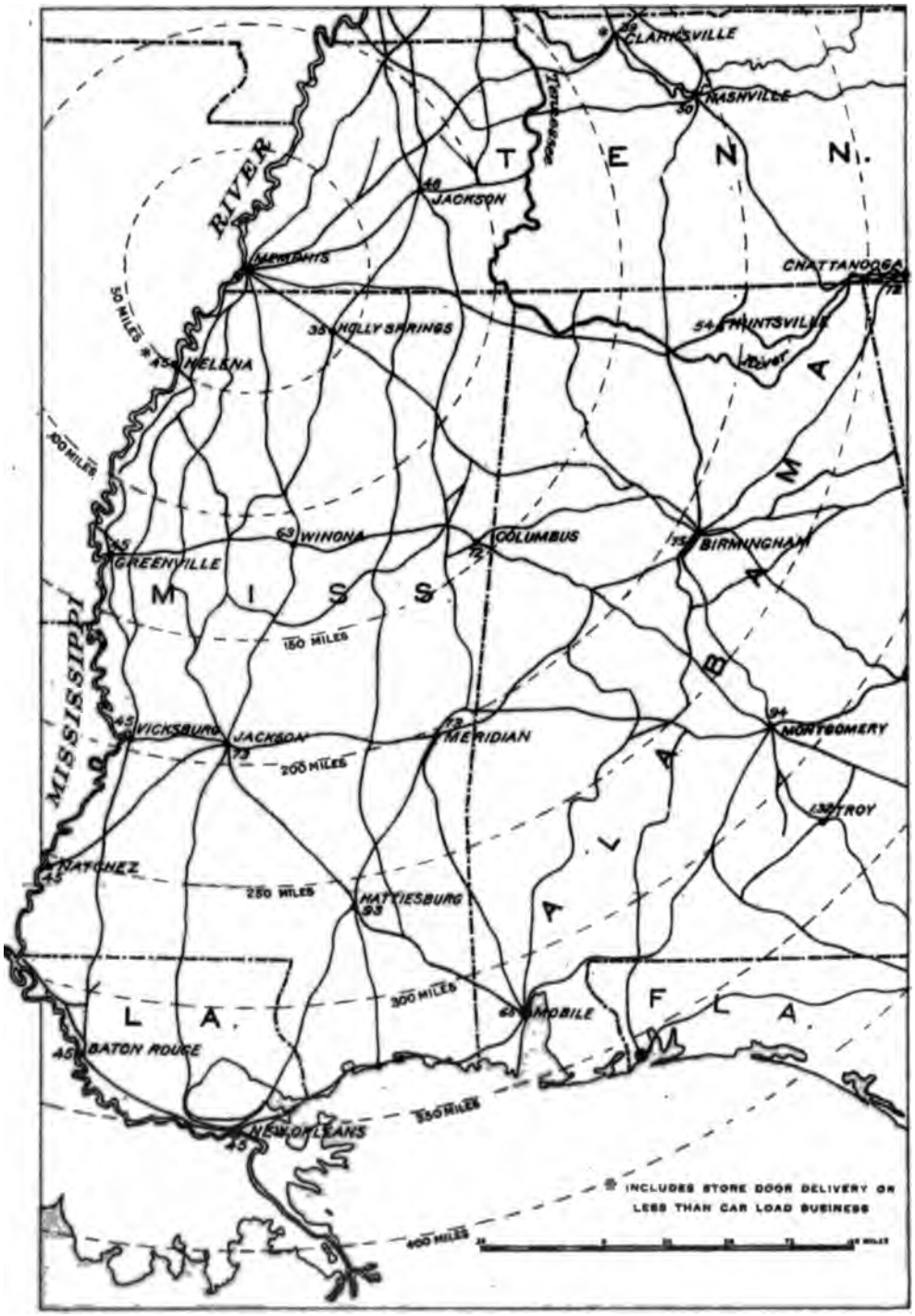
HARGED FOR THE TRANSPORTATION
CLASSED AS FIRST CLASS IN THE
TION AS NOTED IN THE LEGEND

JIL FROM ST. LOUIS, MO.,

THE MISSISSIPPI AND OHIO RIVERS
ID INTERIOR POINTS.

100 POUNDS. EFFECTIVE SEPTEMBER 1, 1907.

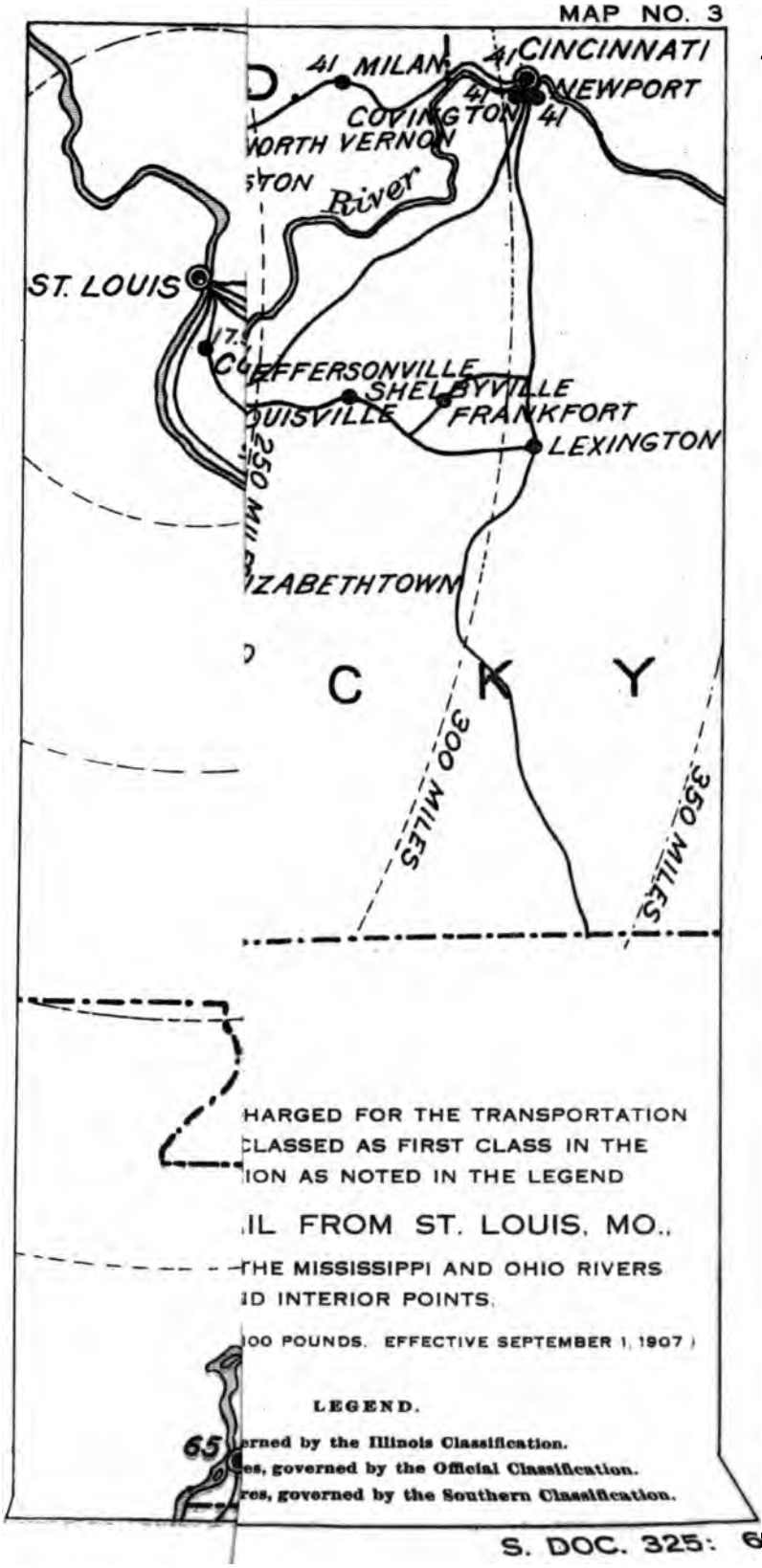
MAP NO. 4



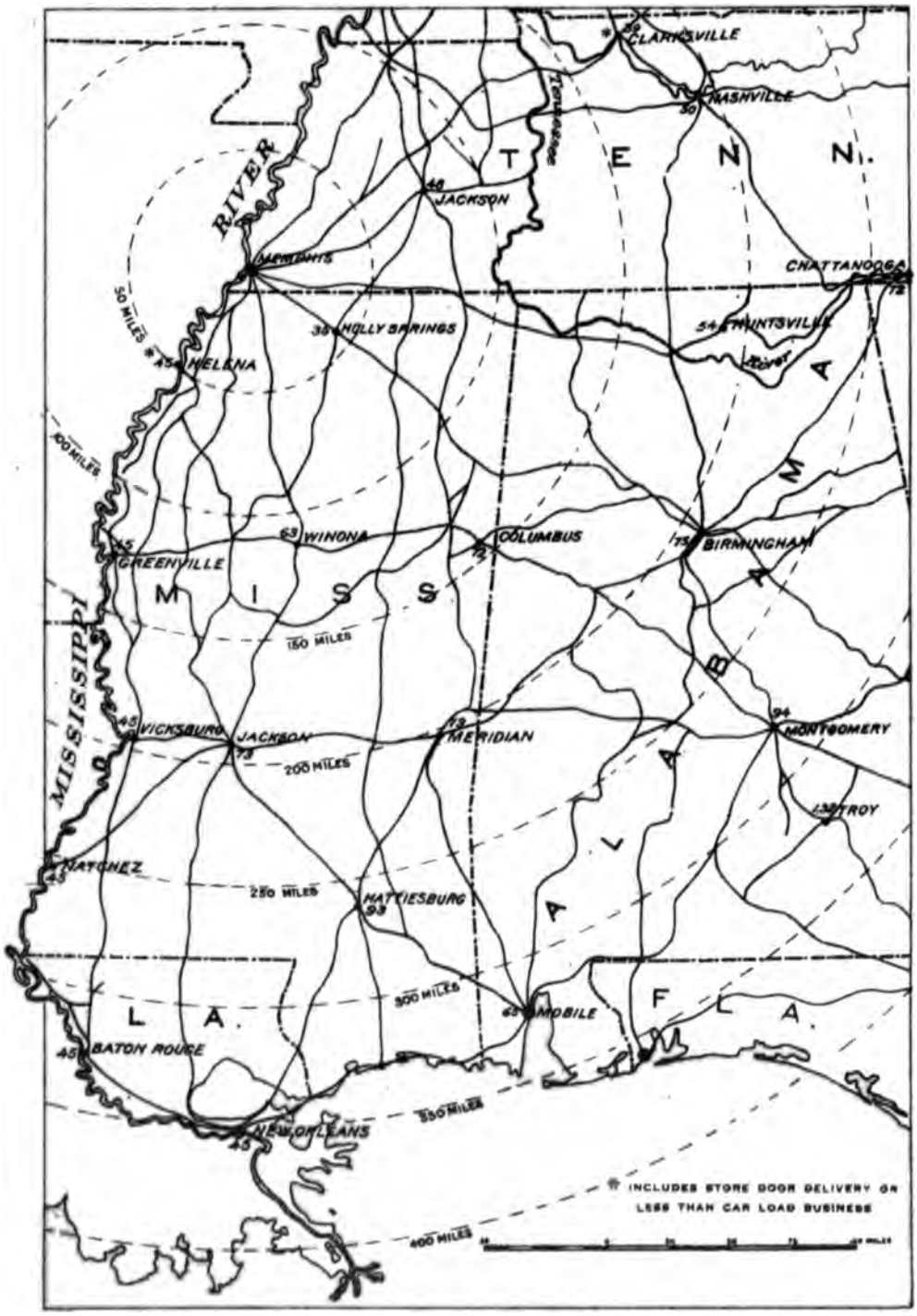
FREIGHT RATES CHARGED FOR THE TRANSPORTATION OF ARTICLES CLASSED AS FIRST CLASS IN THE SOUTHERN CLASSIFICATION VIA ALL RAIL FROM MEMPHIS, TENN. TO LOWER MISSISSIPPI RIVER POINTS AND INTERIOR POINTS.

(RATES IN CENTS PER 100 POUNDS EFFECTIVE JULY, 1, 1907.)

MAP NO. 3


41 MILAN
41 CINCINNATI
NEWPORT
COVINGTON
41
NORTH VERNON
River
ST. LOUIS
JEFFERSONVILLE
SHELBYVILLE
LOUISVILLE
FRANKFORT
LEXINGTON
250 MILES
ZABETHTOWN
C K Y
300 MILES
350 MILES
HARGED FOR THE TRANSPORTATION
CLASSED AS FIRST CLASS IN THE
ION AS NOTED IN THE LEGEND
IL FROM ST. LOUIS, MO.,
THE MISSISSIPPI AND OHIO RIVERS
ID INTERIOR POINTS.
00 POUNDS. EFFECTIVE SEPTEMBER 1, 1907.)
LEGEND.
65
erned by the Illinois Classification.
es, governed by the Official Classification.
res, governed by the Southern Classification.

MAP NO. 4



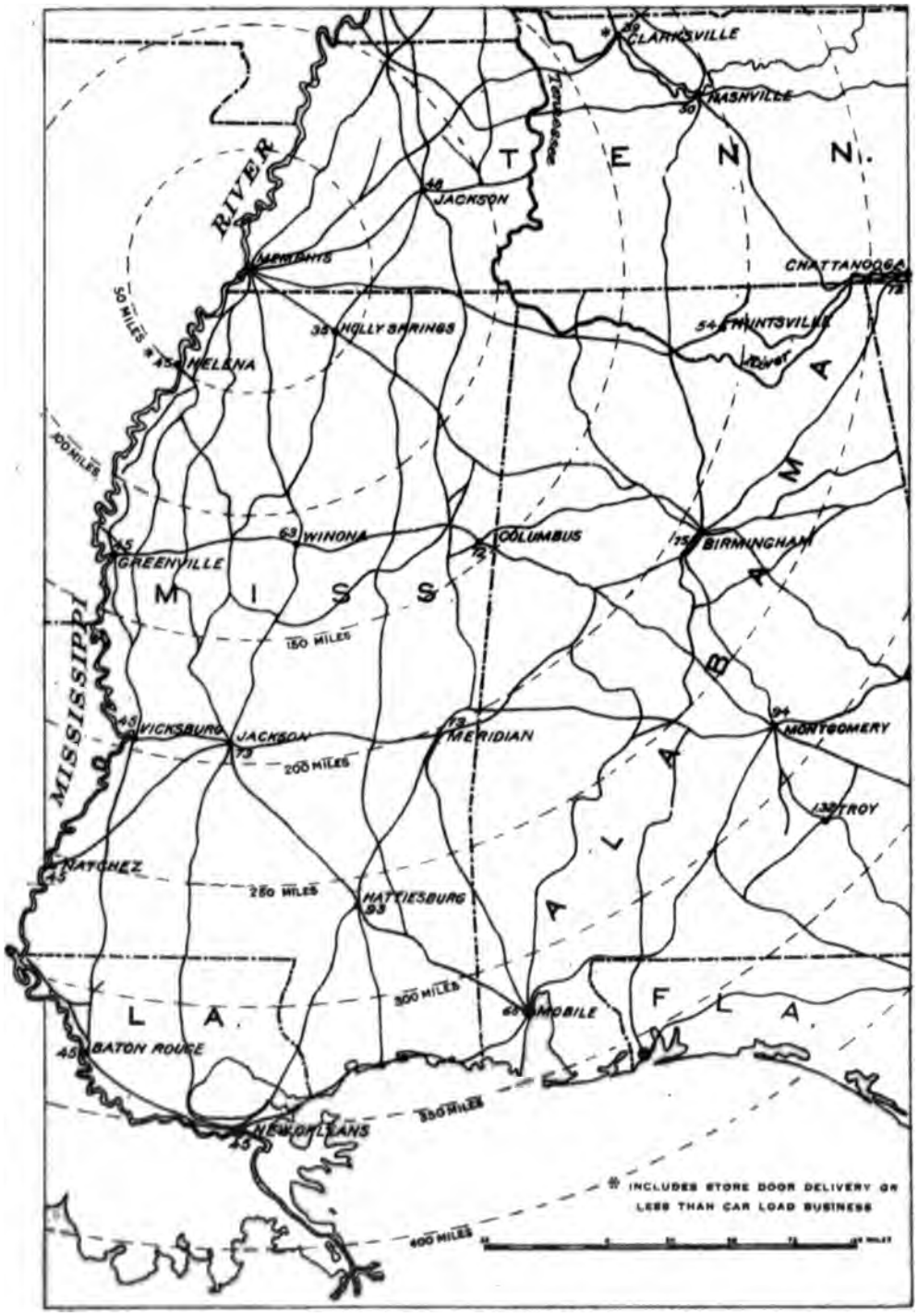
FREIGHT RATES CHARGED FOR THE TRANSPORTATION OF ARTICLES CLASSED AS FIRST CLASS IN THE SOUTHERN CLASSIFICATION VIA ALL RAIL FROM MEMPHIS, TENN. TO LOWER MISSISSIPPI RIVER POINTS AND INTERIOR POINTS.

(RATES IN CENTS PER 100 POUNDS EFFECTIVE JULY 1, 1907.)

TABLE 113—*Freight rates charged for the transportation of classified traffic (governed by the Southern Classification) via all rail from Memphis, Tenn., to Mississippi River and southern interior points, in effect July 1, 1907 (Map 4)*

To—	Distance.	Classes, in cents per 100 pounds.												
		1.	2.	3.	4.	5.	6.	A.	B.	C.	D.	E.	H.	F.
MISSISSIPPI RIVER POINTS.	*Miles.*													*Per bbl.*
Cairo, Ill.														
Helena, Ark.		45	40	32	25	20	17	12	15	14	12	15	18	15
Greenville, Miss.														
Vicksburg, Miss.														
Natchez, Miss.		45	40	32	25	20	17	12	15	14	12	15	18	18
Baton Rouge, La.														
New Orleans, La.														
Mobile, Ala.		65	54	47	35	28	25	18	18	18	13	21	50	27
INTERIOR CITIES.														
Clarksville, Tenn.		39	34	29	24	19	16	16	16	11	11	16	22	20
Nashville, Tenn.		50	40	35	27	23	19	18	20	11	11	23	23	20
Jackson, Tenn.		48	42	36	30	24	22	22	22	18½	15	22	22	37
Chattanooga, Tenn.		72	61	53	43	36	26	16	22	19	15	30	35	30
Holly Springs, Miss.		35	32	26	23	20	18	17	16	10½	10	20	25	21
Winona, Miss.		63	51	38	35	29	24	21	23	14	13	22	30	28
Columbus, Miss.		72	58	44	39	32	26	24	27	16	16	23	29	32
Jackson, Miss.		73	63	52	44	37	33	28	25½	20	18	27	48	36
Meridian, Miss.		73	63	52	44	37	33	28	25½	20	18	27	48	36
Hattiesburg, Miss.		93	80	67	56	46	39	33	30½	32	23	39	56	47
Huntsville, Ala.		54	50	39	31	25	20	17	21	19	15	25	31	30
Birmingham, Ala.		75	65	54	43	36	26	24	27	20	16	35	35	32
Montgomery, Ala.		94	83	74	59	48	37	24	27	20	16	44	35	32
Troy, Ala.		132	112	98	83	69	54	39	40	30	25	65	61	51

MAP NO. 4



FREIGHT RATES CHARGED FOR THE TRANSPORTATION OF ARTICLES CLASSED AS FIRST CLASS IN THE SOUTHERN CLASSIFICATION VIA ALL RAIL FROM MEMPHIS, TENN. TO LOWER MISSISSIPPI RIVER POINTS AND INTERIOR POINTS.

(RATES IN CENTS PER 100 POUNDS EFFECTIVE JULY 1, 1907)

TABLE 115—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from Pittsburg, Pa., to points on the Ohio and Mississippi rivers*

[Classes governed by the Official Classification: In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.												Commodities.			
			1		2		3		4		5		6		Iron and steel manufacture.		Whisky and all kinds oil.	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	Less car loads. River.	Car loads. River.	Less car loads. River.	Car loads. River.
Ohio River.	*Miles.*	*Miles*													*Per cwt.*	*Per cwt.*	*Per bbl.*	*Per bbl.*
Steubenville, Ohio	43	68	10.5	8	10.5	8.0	10.0	7.5	8.0	7.0	7.5	6	6.0	5.0	4.0	3.0	40	25
Wheeling, W. Va	67	90	17.0	14	15.0	12.0	13.5	10.0	10.0	7.0	8.0	6	7.0	6.0	4.0	3.0	40	25
Moundsville, W. Va	78	101	23.0	17	22.0	16.0	18.0	12.0	12.0	8.0	9.0	6	8.0	6.0	6.0	5.0	40	25
Marietta, Ohio	235	171	31.5	20	27.0	18.0	21.5	15.0	14.0	10.0	11.5	8	9.0	7.0	8.0	6.0	50	30
Parkersburg, W. Va	161	184	31.5	30	27.0	25.0	21.5	20.0	14.0	13.0	11.5	10	9.0	8.0	8.0	6.0	50	30
Gallipolis, Ohio	245	267	41.0	25	35.0	20.0	26.0	15.0	18.0	12.5	15.0	10	12.0	8.0	10.0	8.0	50	35
Huntington, W. Va	282	.....	41.0	25	35.0	20.0	26.0	15.0	18.0	12.5	15.0	10	12.0	8.0	11.0	8.0	50	35
Ironton, Ohio	302	325	41.0	25	35.0	20.0	26.0	15.0	18.0	12.5	15.0	10	12.0	8.0	11.0	8.0	50	35
Portsmouth, Ohio	285	354	41.0	30	35.0	25.0	26.0	20.0	18.0	12.5	15.0	12	12.0	10.0	11.0	8.0	60	40
Cincinnati, Ohio	313	467	41.0	25	35.0	22.5	26.0	20.0	18.0	12.5	15.0	11	12.0	9.0	11.0	8.0	60	40
Madison, Ind	.....	553	45.0	30	30.0	25.0	30.0	22.5	21.0	15.0	18.0	13	15.0	12.0	13.0	11.0	75	50
Louisville, Ky	423	596	45.0	30	39.0	25.0	30.0	22.5	21.0	15.0	18.0	13	15.0	12.0	13.0	11.0	75	50
Owensboro, Ky	537	749	57.5	50	50.0	40.0	38.5	30.0	27.0	25.0	23.0	20	19.0	18.0	20.0	15.0	120	70
Evansville, Ind	579	783	51.0	40	44.5	35.0	34.0	27.5	24.0	20.0	20.5	18	17.0	15.0	16.0	13.0	100	60
Paducah, Ky	649	920	59.5	50	52.5	40.0	40.0	30.0	29.0	25.0	24.5	20	20.5	18.0	20.0	15.0	120	70
Cairo, Ill	684	967	59.5	45	52.5	40.0	40.0	30.0	29.0	22.0	24.5	20	20.5	16.0	30.0	20.0	150	100
Mississippi River.																		
St. Louis, Mo	621	1,167	56.5	45	49.5	35.0	38.0	30.0	27.0	20.0	23.0	18	19.0	16.5	18.0	16.5	100	75
Chester, Ill	690	1,087	59.5	.....	52.5	.....	40.0	.....	29.5	.....	24.5	.....	20.5	.....	.....	.....	.....	.....
Hickman, Ky	.....	1,003	.....	60	.....	50.0	.....	40.0	.....	30.0	.....	25	.....	24.0	25.0	22.5	150	125
Memphis, Tenn [a]	816	1,197	91.0	65	70.0	50.0	59.0	35.0	46.0	30.0	39.0	25	33.0	21.0	22.5	18.0	125	100

[a] Governed by the Southern Classification.

TABLE 114—*Freight rates charged for the transportation of articles (governed by the Southern Classification) via rail and via river from St. Louis, Mo., to points on the Tennessee River*

[In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.																		
			1		2		3		4		5		6		All rail.						
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	A.	B.	C.	D.	E.	H.	F.
	Miles	*Miles*																			*Bbl.*
Paducah, Ky	172	.....	36	.....	30	.....	25	.....	19	.....	15	.....	12.5	.....	11.5	11.5	10.5	8.5	13.5	16.5	21
Gilbertsville, Ky	.....	.....	45	60	40	50	35	45	30	40	25	30	20.0	25	18.0	19.0	15.0	11.0	21.0	27.0	27
Birmingham, Ky	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Hamlin, Ky	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Danville, Tenn	263	.....	97	60	82	50	65	45	58	40	48	30	42.0	25	41.0	45.0	29.5	23.5	44.0	46.0	39
Johnsonville, Tenn	279	.....	76	60	64	50	57	45	45	40	37	30	32.0	25	27.0	31.0	27.0	22.0	33.0	35.0	54
Perryville, Tenn	314	.....	82	60	72	50	62	45	50	40	38	30	33.0	25	33.0	33.0	23.0	21.0	37.0	43.0	46
Clifton, Tenn	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Savannah, Tenn	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Pickwick, Tenn	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Waterloo, Ala	.....	.....	.....	60	.....	50	.....	45	.....	40	.....	30	.....	25	.....	.....	.....	.....	.....	.....	.....
Sheffield, Ala	376	.....	102	.....	88	.....	75	.....	59	.....	50	.....	38.0	.....	30.0	34.0	30.0	24.0	42.0	43.0	52
Florence, Ala	378	.....	102	.....	88	.....	75	.....	59	.....	50	.....	38.0	.....	30.0	34.0	30.0	24.0	42.0	43.0	52
Decatur, Ala	414	.....	102	.....	88	.....	75	.....	59	.....	50	.....	38.0	.....	30.0	34.0	30.0	24.0	42.0	43.0	52
Incline, Ala																					
Guntersville, Ala	.....	.....	102	.....	88	.....	75	.....	59	.....	50	.....	38.0	.....	30.0	34.0	30.0	24.0	42.0	43.0	52
Bridgeport, Ala																					
South Pittsburg, Tenn																					
Chattanooga, Tenn	535	.....	99	.....	84	.....	74	.....	59	.....	50	.....	38.0	.....	27.0	34.0	30.0	24.0	42.0	49.0	52
Kingston, Tenn																					

[illegible]

[illegible]

[illegible]

OHIO AND BIG KANAWHA RIVERS

TABLE 116—*Statement of freight charges, distance, and rate per ton-mile charged for the transportation of bituminous coal via all rail from the Kanawha district, located on the Chesapeake and Ohio Railway, to points on the Ohio River and to inland Kentucky points (Map 6)*

[In effect August 1, 1907]

To—	Distance.[a]	Rate per net ton.	Rate per ton-mile.	To—	Distance.[a]	Rate per net ton.	Rate per ton-mile.
OHIO RIVER POINTS.	*Miles.*	*Cents.*	*Cents.*	OHIO RIVER POINTS—Continued.	*Miles.*	*Cents.*	*Cents.*
Huntington, W. Va	88	60	0.68	Covington, Ky	248	90	0.36
Kenova, W. Va	95	60	.63	Cincinnati, Ohio	250	100	.40
Catlettsburg, Ky	98	80	[b] .82	Louisville, Ky	313	100	.32
Ashland, Ky	104	80	[b] .77				
Ironton, Ohio [c]	108	85	[d] .79	INLAND CITIES.			
Portsmouth, Ohio [e]	135	90	.67				
Garrison, Ky	147	80	.54	Olive Hill, Ky	145	120	.83
Vanceburg, Ky	156	80	.51	Enterprise, Ky	151	120	.79
Maysville, Ky	186	80	.43	Morehead, Ky	163	120	.74
Williamsburg, Ky	208	85	.41	Winchester, Ky	209	120	.57
Dayton, Ky	243	90	.37	Lexington, Ky	228	120	.53
Newport, Ky	246	90	.37				

[a] Miles from Gauley, W. Va.
[b] Rate for manufacturing purposes, 50 cents per ton.
[c] Via Ashland, Ky., and barge.
[d] Rate for manufacturing purposes, 65 cents per ton.
[e] Via South Portsmouth.

MISSISSIPPI RIVER (LOWER)

TABLE 117—*Freight rates charged for the transportation of articles in the Southern Classification, via all rail, from New Orleans, La., to Mississippi River, Gulf, and interior points (Map 5.)*

[In effect September 1, 1907]

To—	Distance.	Classes in cents per 100 pounds.												
		1.	2.	3.	4.	5.	6.	A.	B.	C.	D.	E.	H.	F. Per bbl.
MISSISSIPPI RIVER.	*Miles.*													
Baton Rouge, La	89	25	23	20	16	14	12		10 11	11 13	8 10	15 16	....	18 20
Bayou Sara, La	125	25	23	20	16	14	12	8 10	10 11	11 13	8 10	15 16	....	18 20
Natchez, Miss	214													
Vicksburg, Miss	236													
Greenville, Miss	318													
Rosedale, Miss	355	45	40	32	25	20	17	12	15	14	12	15	18	18 25
Friars Point, Miss	399													
Helena, Ark	421													
Memphis, Tenn	456													
GULF AND INTERIOR.														
Mobile, Ala	141	50	39	38	31	27	16		15	12½	10	20	18	25
Pensacola, Fla	245	55	45	38	31	27	16	18	18	15	13	25	25	30
Biloxi, Miss	81	29	25	22	19	18	17	17	17	11	9	17	17	22
Booneville, Miss	369	89	71	58	49	42	37	33	35	31	27	40	45	60
Brookhaven, Miss	129	66	53	43	36	31	26	23 26	25 30	18 23	15 18	29	38	34 42
Canton, Miss	207	77	63	52	44	37	33	28 30	27 32	22 25	18 22	30	38	37 44
Clarksdale, Miss	379	74	63	53	44	37	32	24 27	28 32	29 33	21	30 35	....	41 52½
Columbus, Miss	294	85	68	56	47	40	35	33	35	29	25	40	45	55
Corinth, Miss	390	90	80	67	55	45	37	32	35	28	26	40	48	46 53
Crystal Springs, Miss	159	72	58	46	39	34	29	23 27	25 30	18 23	15 18	29	38	34 42
Enterprise, Miss	180	73	61	50	40	33	27	24	25½	20	16	27	40	36
Gloster, Miss	144	66	57	47	40	33	30	22 30	25 33	24 30	19½ 24	30 40	....	39 49
Greenwood, Miss	281	64	54	46	39	32	29	22 27	24 28	16 18	15 18	22	32	32 36

MAP NO. 5

FREIGHT RATES CHARGED FOR THE TRANSPORTATION OF ARTICLES CLASSED AS FIRST CLASS IN THE SOUTHERN CLASSIFICATION VIA ALL RAIL FROM NEW ORLEANS LA. TO LOWER MISSISSIPPI RIVER POINTS AND INTERIOR POINTS

RATES IN CENTS PER 100 POUNDS — EFFECTIVE SEPTEMBER [illegible]

S. DOC. 325

FREIGHT RATES CHARGED FOR THE TRANSPORTATION OF BITUMINOUS COAL VIA ALL RAIL FROM THE KANAWHA DISTRICT TO OHIO RIVER POINTS AND INTERIOR KENTUCKY POINTS

(RATES IN CENTS PER NET TON EFFECTIVE AUGUST 1, 1907.)

TABLE 118—*Freight rates charged for the transportation of articles in the Western Classification (except as otherwise indicated) via rail and via river from New Orleans, La., to points on the Mississippi River*

[In effect September 1, 1907]

			Classes, in cents per 100 pounds.																						Per bbl.
Western Classification			1		2		3		4		5		A		B		C		D		E		E	H	F
Southern Classification			1		2		3		4		5		6		A		B		C		D				
TO—	Distance. By rail.	Distance. By river.	All rail.	River.	All rail.	River	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	All rail.	All rail.
	Miles	*Miles*																							
Gretna, La.	2	1	25	40	18	25	15	30	10	30	10	21	10	21	8	20	7	20	6	16	5	13	.....	.....	.....
Harvey, La.	.....	.....	25	40	18	25	15	30	10	30	10	21	10	21	8	20	7	20	6	16	5	13	.....	.....	.....
Hanson City, La.	.....	.....	....	40	....	25	....	30	....	30	....	21	....	21	.....	20	.....	20	.....	16	.....	13	.....	.....	.....
Davis, La.	19	.....	25	40	18	25	15	30	10	30	10	21	10	21	8	20	7	20	6	16	5	13	.....	.....	.....
St. Charles, La.	.....	.....	25	40	18	25	15	30	10	30	10	21	10	21	8	20	7	20	6	16	5	13	.....	.....	.....
Hahnville, La.	25	28	25	40	18	25	15	30	10	30	10	21	10	21	8	20	7	20	6	16	5	13	.....	.....	.....
Laplace, La.[a]	30	.....	25	40	23	25	20	30	18	30	15	21	12	21	8 10	20	10 11	20	11 13	16	8 10	13	15 20	.....	18 20
Edgard, La.	.....	.....	....	40	....	25	....	30	....	30	....	21	....	21	.....	20	.....	20	.....	16	.....	13	.....	.....	.....
Lions, La.	.....	.....	....	40	....	25	....	30	....	30	....	21	....	21	.....	20	.....	20	.....	16	.....	13	.....	.....	.....
Lutcher, La.[a]	42	.....	25	40	23	25	20	30	18	30	15	21	12	21	8 10	20	10 11	20	11 13	16	8 10	13	15 20	.....	18 20
Convent, La.[a]	50	.....	25	40	23	25	20	30	18	30	15	21	12	21	8 10	20	10 11	20	11 13	16	8 10	13	15 20	.....	18 20
Donaldsonville, La.	64	82	25	30	22	26	20	23	15	20	15	15	15	15	12	12	10	12	8	10	8	8	.....	.....	.....
White Castle, La.	75	.....	25	30	22	26	20	23	15	20	15	15	15	15	12	12	10	12	8	10	8	8	.....	.....	.....
Bayou Goula, La.	.....	97	25	30	22	26	20	23	15	20	15	15	15	15	12	12	10	12	8	10	8	8	.....	.....	.....
St. Gabriel, La.[a]	75	.....	25	30	23	26	20	23	18	20	15	15	12	15	8 10	12	10 11	12	11 13	10	8 10	8	15 20	.....	18 20
Plaquemine, La.	85	110	25	30	22	26	20	23	15	20	15	15	15	15	12	12	10	12	8	10	8	8	.....	.....	.....
Baton Rouge, La.[a]	79	130	25	30	22 23	26	20 20	23	15 16	20	15 14	15	15 12	15	8–12 10	12	10–10 11	12	11–8 13	10	8–8 10	8	15 16	.....	18 20
Port Allen, La.	81	131	25	30	22	26	20	23	15	20	15	15	15	15	12	12	10	12	8	10	8	8	.....	.....	.....
Bayou Sara, La.[a]	107	164	25	30	23	26	20	23	16	20	14	15	12	15	8 10	12	10 11	12	11 13	10	8 10	8	15 16	.....	18 20
Angola, La.	130	199	....	50	....	45	....	35	....	30	....	25	....	25	.....	20	.....	18	.....	16	.....	15	.....	.....	.....
Black Hawk, La.	.....	216	52	50	45	45	37	35	29	30	19	25	21	25	17	20	16	18	14	16	12	15	.....	.....	.....
Vidalia, La.	.....	263	....	50	....	45	....	35	....	30	....	25	....	25	.....	20	.....	18	.....	16	.....	15	.....	.....	.....
Natchez, Miss.[a]	214	263	45	....	40	....	32	....	25	....	20	....	17	....	12	....	15	....	14	....	12	....	15	18	18 25

[illegible]

[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

TABLE 119—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from New Orleans, La., to points on the Red River*

[Classes governed by the Western Classification: In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.																			
			1		2		3		4		5		A		B		C		D		E	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
	Miles	*Miles*																				
Shreveport, La	317	.....	60	60	50	50	40	40	30	30	22	22	25	25	20	20	17	17	16	16	15	15
Nicholson, La	311	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Robson, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Arnsberg, La	304	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Gayle, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Elm Grove, La	298	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
McDade, La	296	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Poole, La	293	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Ninock, La	289	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Howard, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Loggy Bayou, La	286	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Williams, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
East Point, La	287	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Starpoint, La	286	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Crichton, La	284	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Grand Bayou, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Altenas, La	279	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Pecan, La	.....	.....	.....	80	.....	70	.....	60	.....	50	.....	40	.....	50	.....	38	.....	32	.....	26	.....	20
Gahagan, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Armistead, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Coushatta, La	271	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Hollingsworth, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Lake End, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Grappes Bluff, La	261	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Powhatan, La	.....	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Campti, La	254	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Hagen, La	251	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Grand Ecore, La	.....	.....	75	80	63	70	57	60	44	50	35	40	35	50	34	38	30	32	27	26	25	20
Natchitoches, La	.....	.....	75	80	63	70	57	60	44	50	35	40	35	50	34	38	30	32	27	26	25	20
Colora, La	242	.....	80	80	70	70	60	60	50	50	40	40	50	50	38	38	32	32	26	26	20	20
Bayou Natchez, La	.....	.....	75	80	63	70	57	60	44	50	35	40	35	50	34	38	30	32	27	26	25	20
Bermuda, La	.....	.....	.....	80	.....	70	.....	60	.....	50	.....	40	.....	50	.....	38	.....	32	.....	26	.....	20

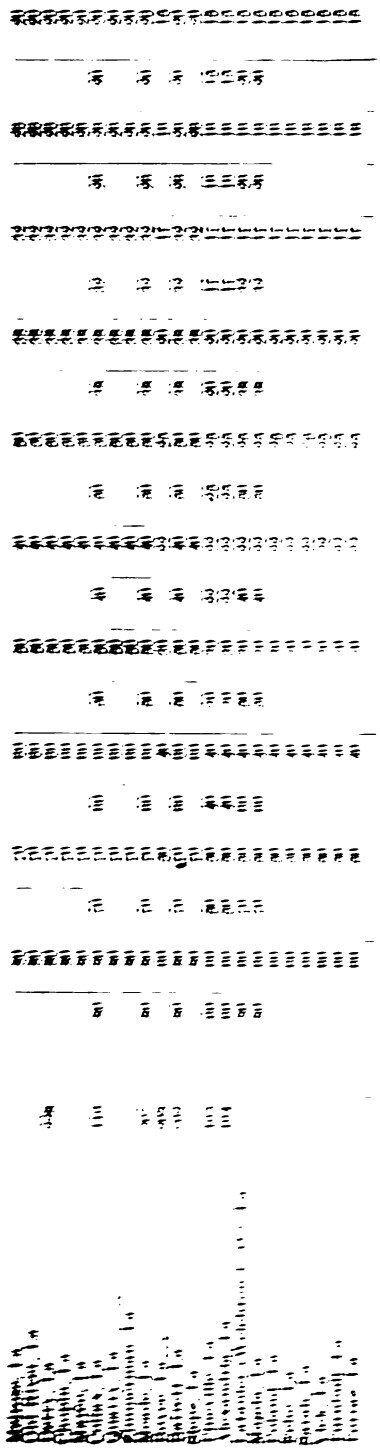


TABLE 119—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from New Orleans, La., to points on the Red River*—Continued

To—	By rail.	By river.	Commodities, in cents per 100 pounds, except as indicated.															
			Fertilizer.				Flour.				Grain, hay, etc.				Salt, in sacks or barrels.			
			Carload.		Less carload.		Carload.		Less carload.		Carload.		Less carload.		Carload.		Less carload.	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
	Miles	*Miles*																
Shreveport, La	317	.....	12.5	12.5	.....	.....	.....	15	.....	.....	.....	.....	.....	.....	10.0	10.0	.....	.....
Nicholson, La	311	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Robson, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Arnsberg, La	304	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Gayle, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Elm Grove, La	298	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
McDade, La	296	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Poole, La	293	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Ninock, La	289	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Howard, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Loggy Bayou, La	286	.....	.....	12.0	.....	16	.....	15	.....	20	.....	20	.....	25	.....	18.0	.....	23
Williams, La	.....	.....	12.0	12.0	.....	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
East Point, La	287	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Starpoint, La	286	.....	.....	12.0	.....	16	.....	15	.....	20	.....	20	.....	25	.....	18.0	.....	23
Crichton, La	284	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Grand Bayou, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Altenas, La	279	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Pecan, La	.....	.....	.....	12.0	.....	16	.....	15	.....	20	.....	20	.....	25	.....	18.0	.....	23
Gahagan, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Armistead, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Coushatta, La	271	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Hollingsworth, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Lake End, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Grappes Bluff, La	261	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Powhatan, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Campti, La	254	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Hagen, La	251	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Grand Ecore, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Natchitoches, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Colora, La	242	.....	12.0	12.0	.....	16	17	15	30	20	.....	20	.....	25	18.0	18.0	30	23
Bayou Natchez, La	.....	.....	12.0	12.0	16.0	16	15	15	20	20	20	20	25	25	18.0	18.0	23	23
Bermuda, La	.....	.....	.....	12.0	.....	16	.....	15	.....	20	.....	20	.....	25	.....	18.0	.....	23
Melrose, La	.....	.....	.....	12.0	.....	16	.....	15	.....	20	.....	20	.....	25	.....	18.0	.....	23

TABLE 120—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from Shreveport, La., to points on the Red and Mississippi rivers*

[Classes governed by the Western Classification: In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.																			
			1		2		3		4		5		A		B		C		D		E	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
Red River.	*Miles.*	*Miles.*																				
Nicholson, La	6			40		35		30		25		20		25		19		15		12		10
Robson, La			30	40	25	35	20	30	15	25	10	20	15	25	13	19	11	15	11	12	9	10
Arnsberg, La	13			40		35		30		25		20		25		19		15		12		10
Gayle, La			30	40	25	35	20	30	15	25	10	20	15	25	13	19	11	15	11	12	9	10
Elm Grove, La	18			40		35		30		25		20		25		19		15		12		10
McDade, La	20			40		35		30		25		20		25		19		15		12		10
Poole, La	24			40		35		30		25		20		25		19		15		12		10
Ninock, La	28			40		35		30		25		20		25		19		15		12		10
Howard, La			40	40	35	35	30	30	25	25	20	20	25	25	19	19	15	15	12	12	10	10
Loggy Bayou, La	30			40		35		30		25		20		25		19		15		12		10
Williams, La				40		35		30		25		20		25		19		15		12		10
East Point, La	33			40		35		30		25		20		25		19		15		12		10
Starpoint, La	34			60		52		45		38		30		38		29		21		18		14
Crichton, La	36			60		52		45		38		30		38		29		21		18		14
Grand Bayou, La				60		52		45		38		30		38		29		21		18		14
Altena, La	38			60		52		45		38		30		38		29		21		18		14
Pecan, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Gahagan, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Armistead, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Coushatta, La	45			60		52		45		38		30		38		29		21		18		14
Hillingsworth, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Lake End, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Grappes Bluff, La	56			60		52		45		38		30		38		29		21		18		14
Powhatan, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Campti, La	62			60		52		45		38		30		38		29		21		18		14
Hagen, La	66			60		52		45		38		30		38		29		21		18		14
Grand Ecore, La				60		52		45		38		30		38		29		21		18		14
Natchitoches, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Colora, La	74			60		52		45		38		30		38		29		21		18		14
Bayou Natchez, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14
Bermuda, La				60		52		45		38		30		38		29		21		18		14
Melrose, La				60		52		45		38		30		38		29		21		18		14
Old River, La			60	60	52	52	45	45	38	38	30	30	38	38	29	29	21	21	18	18	14	14

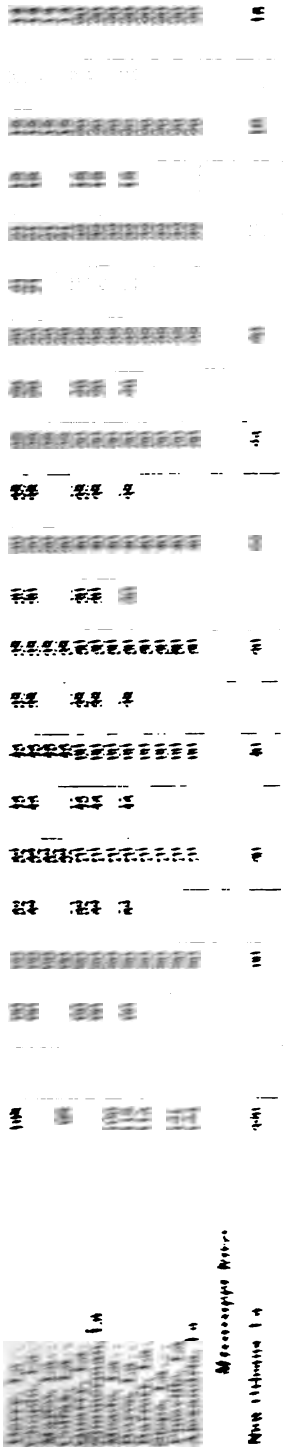
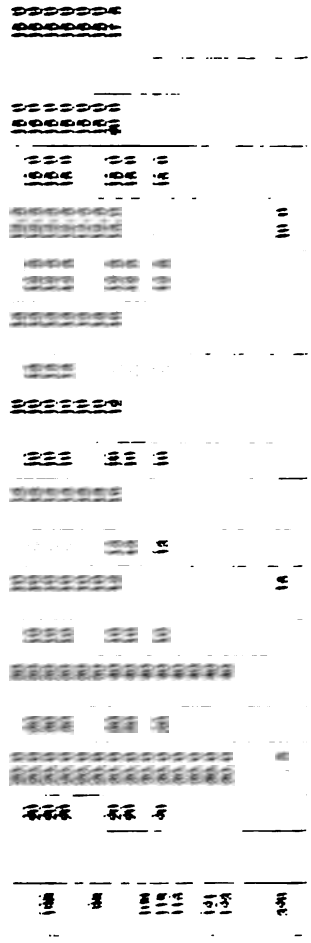


TABLE 120—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from Shreveport, La., to points on the Red and Mississippi rivers*—Continued

To—	By rail.	By river.	Commodities, in cents per 100 pounds.																	
			Bagging and ties.				Cotton-seed meal in sacks.				Fertilizer in sacks.				Grain.				Lumber.	
			Carloads.		Less carload.		Carloads.		Less carload.		Carloads.		Less carload.		Carloads.		Less carload.			
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
Red River.	*Miles.*	*Miles.*																		
Nicholson, La	6		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Robson, La			10	13.0	13	20	8	10	10	10	8	10	10	10	8.0	10.0	10.0	12.5	....	12.5
Arnsberg, La	13		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Gayle, La			10	13.0	13	20	8	10	10	10	8	10	10	10	8.0	10.0	10.0	12.5	....	12.5
Elm Grove, La	18		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
McDade, La	20		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Poole, La	24		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Ninock, La	28		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Howard, La			13	13.0	20	20	10	10	10	10	10	10	10	10	10.0	10.0	12.5	12.5	....	12.5
Loggy Bayou, La	30		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Williams, La			....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
East Point, La	33		....	13.0	....	20	....	10	....	10	....	10	....	10	.....	10.0	.....	12.5	....	12.5
Starpoint, La	34		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Crichton, La	36		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Grand Bayou, La			....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Altena, La	38		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Pecan, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Gahagan, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Armstead, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Coushatta, La	45		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Hillingsworth, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Lake End, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Grappes Bluff, La	56		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Powhatan, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Campti, La	62		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Hagen, La	66		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Grand Ecore, La			....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Natchitoches, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Colora, La	74		....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0
Bayou, Natchez, La			20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Bermuda, La			....	20.0	....	30	....	10	....	13	....	10	....	13	.....	12.5	.....	15.0	....	15.0



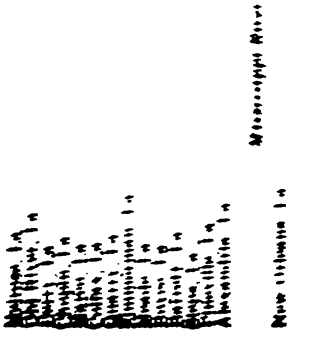


TABLE 121—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from New Orleans, La., to points on the Ouachita and Black rivers*

[Classes governed by the Western Classification: In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.																			
			1		2		3		4		5		A		B		C		D		E	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
Ouachita River.	*Miles*	*Miles*																				
Handy, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Desiard, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Phillips, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Lamkin, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Monroe, La.	292	.....	60	.....	50	.....	40	.....	30	.....	22	.....	25	.....	20	.....	17	.....	16.0	.....	15	.....
Wyatt, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Logtown, La.	280	.....	85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Bosco, La.	277	.....	85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Blankston, La. (Corey, Davis Gin)			85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Sinope, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15
Ouachita, La.			85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Columbia, La.	263	.....	60	60	50	50	40	40	30	30	22	22	25	25	20	20	17	17	16.0	16	15	15
Black River.																						
Lively, La., Duty, La., Stafford, La., Harrisonburg, La., Trinity, La., Security, La., Monterey, La., Armagh, La., Eva, La., New Era, La., Acme, La.			.....	60	.....	50	.....	40	.....	30	.....	25	.....	40	.....	30	.....	25	.....	20	.....	15

TABLE 122—*Freight rates charged for the transportation of cotton via rail and via river from landings on the Red, Black, Ouachita, and tributary rivers to New Orleans, La.*

[Rates in cents per bale, except as indicated: In effect November 15, 1907]

From—	Distance.		All rail.			River.			Rate per bale.[a]			
									Via all rail.		Via river.	
	By rail.	By river.	Compressed, ship-per paying cost of compressing.	Carrier's option of compressing.	Uncompressed, through.	Compressed.	Uncompressed. Insured.[b]	Uncompressed. Uninsured.	Carrier's option of compressing.	Uncompressed, through.	Uncompressed, insured.[b]	Uncompressed, uninsured.
RED RIVER.												
Shreveport, La	317	.....	[c] 30	[c] 40	[c] 42	[c] 32	.....	[c] 42	200	210	.....	210
Nicholson, La	311	.....	.....	225	175	.....	200	175	225	175	200	175
Robson, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Arusberg, La	304	.....	.....	225	175	.....	200	175	225	175	200	175
Gayles, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Elm Grove, La	298	.....	.....	225	175	.....	200	175	225	175	200	175
McDade, La	296	.....	.....	225	175	.....	200	175	225	175	200	175
Poole, La	293	.....	.....	225	175	.....	200	175	225	175	200	175
Ninock, La	289	.....	.....	225	175	.....	200	175	225	175	200	175
Howard, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Loggy Bayou, La	286	.....	.....	225	175	.....	200	175	225	175	200	175
Williams, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
East Point, La	287	.....	.....	225	175	.....	200	175	225	175	200	175
Starpoint, La	286	.....	.....	225	175	.....	200	175	225	175	200	175
Crichton, La	284	.....	.....	225	175	.....	200	175	225	175	200	175
Grand Bayou, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Altena, La	279	.....	.....	225	175	.....	200	175	225	175	200	175
Pecan, La	.....	.....	.....	.....	.....	.....	200	175	.....	.....	200	175
Gahegan, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Arustead, La	.....	.....	.....	225	225	.....	200	175	225	225	200	175
Coushatta, La	271	.....	.....	225	175	.....	200	175	225	175	200	175
Hillingsworth, La	.....	.....	.....	.....	.....	.....	200	175	.....	.....	200	175
Lake End, La	.....	.....	.....	200	200	.....	200	175	200	200	200	175
Grappes Bluff, La	261	.....	.....	225	175	.....	200	175	225	175	200	175
Timon, La	.....	.....	.....	200	200	.....	200	175	200	200	200	175
Powhatan, La	.....	.....	.....	200	200	.....	200	175	200	200	200	175
Campti, La	254	.....	.....	225	175	.....	200	175	225	175	200	175
Hogen, La	251	.....	.....	225	175	.....	200	175	225	175	200	175
Grand Ecore, La	.....	.....	.....	175	.....	.....	175	150	175	.....	175	150
Natchitoches, La	.....	.....	150	.....	.....	.....	175	150	.....	.....	175	150
Colora, La	242	.....	.....	200	150	.....	175	150	200	150	175	150
Bayou Natchez, La	.....	.....	.....	200	200	.....	175	150	200	200	175	150
Bermuda, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Melrose, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Old River, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Derry, La	228	.....	.....	200	200	.....	175	150	200	200	175	150
Chopin, La	.....	.....	.....	200	200	.....	175	150	200	200	175	150
Marco, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Colfax, La	119	.....	.....	200	150	.....	175	150	200	150	175	150
Quarry, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Zimmerman, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Meade, La	207	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Boyce, La	208	.....	.....	200	200	.....	175	150	200	200	175	150
Barrett, La	202	.....	.....	180	180	.....	175	150	180	180	175	150
Sieps, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Pineville, La	195	.....	.....	200	150	.....	175	150	200	150	175	150
Alexandria, La	194	.....	[c] 26	.....	[c] 36	[c] 26	.....	[c] 36	.....	180	.....	180
Latanier, La	.....	.....	.....	200	150	.....	175	150	200	150	175	150
Magda, La	.....	.....	.....	200	150	.....	175	150	200	150	175	150
Poland, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Echo, La	.....	.....	.....	200	150	.....	175	150	200	150	175	150
Sarah, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Vick, La	.....	.....	.....	.....	.....	.....	175	150	.....	.....	175	150
Turnbull, La	.....	.....	.....	.....	100	.....	175	150	.....	100	175	150
Torras, La	.....	.....	.....	.....	80	.....	175	150	.....	80	175	150
Naples, La	.....	.....	.....	175	125	.....	.....	.....	175	125	.....	.....

[a] Where the tariff rates are quoted in cents per 100 pounds the rate per bale is converted on basis of 500 pounds per bale.
[b] Insured rate, at option of carrier and to apply on valuation of $40 per bale or less.
[c] Per 100 pounds.

TABLE [illegible].—*Freight rates charged for the transportation of cotton via rail and via river from landings on the Red, Black, Ouachita, and Tensas rivers to New Orleans, La.*—Continued.

From—	Distance.		Rail rail.			River.			Rate per mile.			
							Incompressed.		Via rail rail.		Via river.	
	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
WIMAHITA RIVER.												
Henry, La.								[illegible]				[illegible]
Ouachita, La.								[illegible]				[illegible]
Jackson, La.								[illegible]				[illegible]
Phillips, La.				[illegible]				[illegible]	[illegible]			[illegible]
Franklin, La.				[illegible]				[illegible]	[illegible]			[illegible]
Morehouse, La.	[illegible]		[illegible]	[illegible]					[illegible]			
Bills McCamis, La.				[illegible]				[illegible]				[illegible]
Lafayette, La.	[illegible]			[illegible]				[illegible]	[illegible]			[illegible]
Jones, La.	[illegible]			[illegible]				[illegible]	[illegible]			[illegible]
Davis Gin, La.								[illegible]				[illegible]
Harrison, La.				[illegible]				[illegible]	[illegible]			[illegible]
Lowe, La.				[illegible]				[illegible]	[illegible]			[illegible]
Simms, La.								[illegible]				[illegible]
Riverton, La.				[illegible]				[illegible]	[illegible]			[illegible]
Columbia, La.	[illegible]			[illegible]	[illegible]			[illegible]	[illegible]	[illegible]		
Silver, La.								[illegible]				[illegible]
Jerry, La.								[illegible]				[illegible]
BLACK RIVER.												
Stafford, La.								[illegible]				[illegible]
Harrisonburg, La.								[illegible]				[illegible]
Trinity, La.								[illegible]				[illegible]
Jonesville, La.								[illegible]				[illegible]
Black River Bluff, La.								[illegible]				[illegible]
Security, La.								[illegible]				[illegible]
Lamore, La.								[illegible]				[illegible]
Monterey, La.								[illegible]				[illegible]
Eva, La.								[illegible]				[illegible]
New Era, La.								[illegible]				[illegible]
Netta, La.								[illegible]				[illegible]
LITTLE RIVER.												
Castor, La.								[illegible]				[illegible]
Pollock, La.				[illegible]				[illegible]	[illegible]			[illegible]
Lecompte, La.				[illegible]				[illegible]	[illegible]			[illegible]
Boston, La.								[illegible]				[illegible]
Bunkum Bridge, La.								[illegible]				[illegible]
BAYOU BOEUF.												
Hovey, La.								[illegible]				[illegible]
Cotton, La.				[illegible]				[illegible]	[illegible]			[illegible]
Cottonport, La.								[illegible]				[illegible]
Delta, La.								[illegible]				[illegible]
Bayou Bisco, La.								[illegible]				[illegible]
Bisco, La.					[illegible]			[illegible]		[illegible]		[illegible]
TENSAS RIVER.												
Little Bend, La.								[illegible]				[illegible]
Tensas Ville, La.					[illegible]			[illegible]		[illegible]		[illegible]
Bayou Bayou, La.					[illegible]			[illegible]		[illegible]		[illegible]
Clayton, La.					[illegible]			[illegible]		[illegible]		[illegible]
Lamartine, La.								[illegible]				[illegible]
Athome, La.								[illegible]				[illegible]
Cherry Chase, La.								[illegible]				[illegible]

[illegible] per 100 pounds.

TABLE 122—*Freight rates charged for the transportation of cotton via rail and via river from landings on the Red, Black, Ouachita, and tributary rivers to New Orleans, La.*—Continued

From—	Distance.		All rail.			River.			Rate per bale			
									Via all rail.		Via river.	
	By rail.	By river.	Compressed, shipper paying cost of compressing.	Carrier's option of compressing.	Uncompressed, through.	Compressed.	Uncompressed. Insured.	Uncompressed. Uninsured.	Carrier's option of compressing.	Uncompressed, through.	Uncompressed, insured.	Uncompressed, uninsured.
BOEUF RIVER.												
Jonesburg, La					a 37			150		185		150
Girard, La								150				150
Boeuf, La								150				150
Rayville, La			125		a 35			150		175		150
Alto, La								150				150
Lucknow, La								150				150
Buckner, La								150				150
Charlieville, La								150				150
Landerneau, La								150				150
Boeuf River, La					a 37			150		185		150

a Per 100 pounds.

TABLE 125.—*Freight rates charged for the transportation of articles in the Western Transportation rate all rail from Seattle, Wash., to Puget Sound, Pacific coast, and interior Washington points, May 1.*

In effect October 11, 1907.

To—	Distance.	Classes in cents per 100 pounds.									
		1	2	3	4	5	6	7	8	9	10
PUGET SOUND:											
	Miles.										
Tacoma, Wash.	4	20	17	16	15	11	9	7	6	5	3
Olympia, Wash.	51	19	14	14	11	11	11	11	11	11	11
Ballard, Wash.	7	11	11	11	11	11	11	11	11	11	11
Edmonds, Wash.	11	11	11	11	11	11	11	11	11	11	11
Everett, Wash.	21	11	11	11	11	11	11	11	11	11	11
Snohomish, Wash.	29	11	11	11	11	11	11	11	11	11	11
Marysville, Wash.	4	11	11	11	11	11	11	11	11	11	11
Stanwood, Wash.	67	11	11	11	11	11	11	11	11	11	11
Mount Vernon, Wash.	71	11	11	11	11	11	11	11	11	11	11
Burlington, Wash.	76	11	11	11	11	11	11	11	11	11	11
Blaine, Wash.	88	11	11	11	11	11	11	11	11	11	11
Bow, Wash.	81	11	11	11	11	11	11	11	11	11	11
Bellingham, Wash.	87	11	11	11	11	11	11	11	11	11	11
Blaine, Wash.	114	11	11	11	11	11	11	11	11	16	12
New Westminster, British Columbia.	106	20	20	20	20	17	17	17	17	17	15
PACIFIC COAST:											
Aberdeen, Wash.	106										
Hoquiam, Wash.	106										
Ocosta, Wash.	117	20	15	11	20	20	20	14	17	11	11
South Bend, Wash.	113										
Portland, Oreg.	188										
INTERIOR CITIES:											
Arlington, Wash.	60	25	11	14	11	17	11	11	11	11	11
Auburn, Wash.	21	20	11	16	11	11	9	7	7	7	4
Centralia, Wash.	11	30	11	14	14	14	14	17	16	11	11
Chehalis, Wash.	15	30	11	15	14	14	14	17	16	11	11
Darrington, Wash.	40	30	16	16	16	16	17	17	17	16	17
Deming, Wash.	111	25	16	17	17	17	14	17	17	11	11
Dryad, Wash.	111	25	16	17	17	17	17	14	17	16	17
Elma, Wash.		25	16	17	17	17	17	14	17	16	17
Frances, Wash.	111	25	16	17	17	17	16	17	14	11	11
Gore, Oreg.	17	40	16	16	16	16	16	14	17	17	17
Goldbar, Wash.	16	25	17	17	17	16	14	17	17	11	11
Hartford, Wash.	40	20	14	11	16	16	11	14	14	17	17
Holton, Oreg.	15	25	16	17	16	16	17	17	16	17	17
Lamira, Wash.	40	40	16	16	16	16	16	14	17	17	17
Leon, Wash.	18	40	16	16	16	16	16	14	17	17	17
McMurray, Wash.	70	25	14	14	17	17	17	17	16	11	11
Malby, Wash.	18	20	17	16	17	17	14	17	17	17	17
Monroe, Wash.	15	15	11	11	17	17	11	11	11	11	11
Montesano, Wash.	15	15	16	16	16	16	16	14	17	17	17
Newaukum, Wash.	19	15	16	16	16	16	14	17	17	11	11
Orting, Wash.	17	15	11	11	17	17	17	11	17	17	17
Pe Ell, Wash.	11	25	16	16	17	17	17	14	17	16	17
Sumner, Wash.	11	25	16	16	16	17	17	14	17	16	17
Tenino, Oreg.	17	25	16	16	16	16	17	17	17	16	17
Tenino, Wash.	17	25	17	17	17	17	17	17	17	11	11
Vancouver, Wash.	70	40	16	16	16	16	16	16	17	16	16
Willapa, Wash.	17	40	16	16	16	16	16	14	17	17	17
Winlock, Wash.	18	40	16	16	16	16	16	14	17	16	17
Woodinville, Wash.	16	20	17	17	17	17	17	17	17	17	17
Yacolt, Wash.	18	17	16	16	16	16	16	16	16	16	16

A similar situation exists in California, as shown graphically in Table 127 and Map 6.

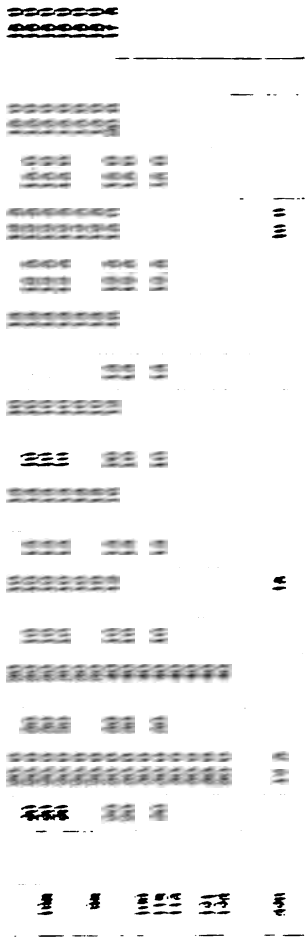
TABLE 124—*Freight rates charged for the transportation of articles, in the Western Classification via rail and via river from Portland, Oreg., to points on the Columbia River (Map 7.)*

[In effect October 15, 1907]

To—	Distance.		Classes, in cents per 100 pounds.																			
			1.		2.		3.		4.		5.		A.		B.		C.		D.		E.	
	By Rail.	By River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.	All Rail.	River.
	Miles.	*Miles.*																				
Astoria, Oreg	100	98	25	25	20	20	15	15	12½	12½	10	10	12½	12½	10	10	10	10	10	10	10	10
Knappa, Oreg	87	88	25	25	20	20	15	15	12½	12½	10	10	12½	12½	10	10	10	10	10	10	10	10
Clifton, Oreg	79	77	25	.....	20	.....	15	.....	12½	.....	10	.....	12½	.....	10	.....	10	.....	10	.....	10	.....
Marshland, Oreg	66	.....	23	.....	20	.....	15	.....	12½	.....	10	.....	12½	.....	9	.....	9	.....	8	.....	8	.....
Maygers, Oreg	56	55	20	13	18	12	14	11	12½	10	10	8	12½	10	9	7½	9	7	8	6	8	6
Rainier, Oreg	46	46	15	10	13	9	11	8	10	7½	7½	7½	7½	7½	7½	7½	6	5	6	5	6	5
Gobel, Oreg	39	40	10	10	9	9	8	8	7	7	6	6	6	6	6	6	5	5	5	5	5	5
Kalama, Wash	41	39	10	10	9	9	8	8	7	7	6	6	6	6	6	6	5	5	5	5	5	5
St. Helens, Oreg	.....	27	.....	10	.....	9	.....	8	.....	7	.....	6	.....	6	.....	6	.....	5	.....	5	.....	5
Ridgefield, Wash	56	.....	20	.....	18	.....	16	.....	14	.....	12	.....	12	.....	12	.....	10	.....	10	.....	9	.....
Knapps, Wash	62	18	20	.....	18	.....	16	.....	14	.....	12	.....	12	.....	12	.....	10	.....	10	.....	9	.....
Vancouver, Wash	71	18	20	15	18	13	16	12	14	10	12	8	12	.....	12	.....	10	.....	10	.....	9	.....
St. Johns, Oreg	6	6	.....	15	.....	13	.....	12	.....	10	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Corbett, Oreg	23	42	15	15	13	13	12	12	10	10	8	8	10	.....	9	.....	7	.....	6	.....	5	.....
Rooster Rock, Oreg	25	44	15	15	13	13	12	12	10	10	8	8	10	.....	9	.....	7	.....	6	.....	5	.....
Cape Horn, Wash	.....	48	.....	15	.....	13	.....	12	.....	10	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Bridal Veil, Oreg	29	.....	15	.....	13	.....	12	.....	10	.....	8	.....	10	.....	10	.....	8	.....	7	.....	6	.....
Multnomah Falls, Oreg	.....	53	.....	15	.....	13	.....	12	.....	10	.....	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Oneonta, Oreg	33	.....	15	.....	13	.....	12	.....	10	.....	8	.....	12	.....	10	.....	9	.....	8	.....	6	.....
Warrendale, Oreg	38	61	15	15	13	13	12	12	10	10	8	8	12	.....	10	.....	10	.....	9	.....	7	.....
Bonneville, Oreg	41	64	15	15	13	13	12	12	10	10	8	8	12	.....	10	.....	10	.....	9	.....	7	.....
Cascade Locks, Oreg	45	69	15	15	13	13	12	12	10	10	8	8	12	.....	10	.....	10	.....	9	.....	7	.....
Carson, Wash	.....	73	.....	20	.....	17	.....	15	.....	12	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Cooks, Wash	.....	83	.....	20	.....	17	.....	15	.....	12	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Stevenson, Wash	.....	71	.....	20	.....	17	.....	15	.....	12	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Wyeth, Oreg	52	.....	18	.....	15	.....	13	.....	12	.....	9	.....	13	.....	10	.....	10	.....	10	.....	7	.....
Viento, Oreg	58	84	20	20	16	17	14	15	12	12	9	9	13	.....	10	.....	10	.....	10	.....	7	.....
Hood River, Oreg	66	93	20	20	17	17	15	15	12	12	9	9	13	.....	12	.....	10	.....	10	.....	7	.....
White Salmon, Wash	.....	93	.....	20	.....	17	.....	15	.....	12	.....	9	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Mosier, Oreg	72	99	25	25	20	20	18	18	15	15	10	10	15	.....	13	.....	12	.....	10	.....	7	.....
Lyle, Wash	.....	105	.....	25	.....	20	.....	18	.....	15	.....	10	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Rowena, Oreg	79	.....	25	.....	20	.....	18	.....	15	.....	10	.....	15	.....	13	.....	12	.....	10	.....	7	.....
The Dalles, Oreg	87	115	25	25	20	20	18	18	15	15	10	10	15	.....	13	.....	12	.....	10	.....	7	.....

TABLE 120—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from Shreveport, La., to points on the Red and Mississippi rivers*—Continued

To—	By rail.	By river.	Commodities, in cents per 100 pounds.																	
			Bagging and ties.				Cotton-seed meal in sacks.				Fertilizer in sacks.				Grain.				Lumber.	
			Carloads.		Less carload.		Carloads.		Less carload.		Carloads.		Less carload.		Carloads.		Less carload.			
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
Red River.	*Miles.*	*Miles.*																		
Nicholson, La	6	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Robson, La	....	....	10	13.0	13	20	8	10	10	10	8	10	10	10	8.0	10.0	10.0	12.5	....	12.5
Arnsberg, La	13	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Gayle, La	....	....	10	13.0	13	20	8	10	10	10	8	10	10	10	8.0	10.0	10.0	12.5	....	12.5
Elm Grove, La	18	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
McDade, La	20	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Poole, La	24	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Ninock, La	28	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Howard, La	....	....	13	13.0	20	20	10	10	10	10	10	10	10	10	10.0	10.0	12.5	12.5	....	12.5
Loggy Bayou, La	30	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Williams, La	....	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
East Point, La	33	....	....	13.0	....	20	....	10	....	10	....	10	....	10	....	10.0	....	12.5	....	12.5
Starpoint, La	34	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Crichton, La	36	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Grand Bayou, La	....	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Altena, La	38	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Pecan, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Gahagan, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Armstead, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Coushatta, La	45	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Hillingsworth, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Lake End, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Grappes Bluff, La	56	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Powhatan, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Campti, La	62	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Hagen, La	66	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Grand Ecore, La	....	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Natchitoches, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Colora, La	74	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0
Bayou, Natchez, La	....	....	20	20.0	30	30	10	10	13	13	10	10	13	13	12.5	12.5	15.0	15.0	....	15.0
Bermuda, La	....	....	....	20.0	....	30	....	10	....	13	....	10	....	13	....	12.5	....	15.0	....	15.0



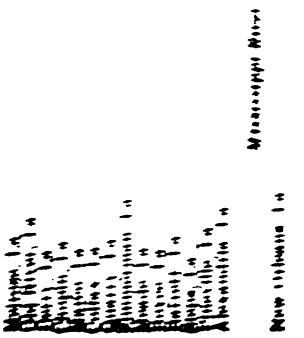


TABLE 121—*Freight rates charged for the transportation of classified traffic and important commodities via rail and via river from New Orleans, La., to points on the Ouachita and Black rivers*

[Classes governed by the Western Classification: In effect September 1, 1907]

To—	By rail.	By river.	Classes, in cents per 100 pounds.																			
			1		2		3		4		5		A		B		C		D		E	
			All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.	All rail.	River.
Ouachita River.	*Miles*	*Miles*																				
Handy, La.				60		50		40		30		25		40		30		25		20		15
Desiard, La.				60		50		40		30		25		40		30		25		20		15
Phillips, La.				60		50		40		30		25		40		30		25		20		15
Lamkin, La.				60		50		40		30		25		40		30		25		20		15
Monroe, La.	292		60		50		40		30		22		25		20		17		16.0		15	
Wyatt, La.				60		50		40		30		25		40		30		25		20		15
Logtown, La.	280		85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Bosco, La.	277		85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Blankston, La. (Corey, Davis Gin)			85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Sinope, La.				60		50		40		30		25		40		30		25		20		15
Ouachita, La.			85	60	70	50	59	40	45	30	35	25	38	40	32	30	29	25	27.5	20	25	15
Columbia, La.	263		60	60	50	50	40	40	30	30	22	22	25	25	20	20	17	17	16.0	16	15	15
Black River.																						
Lively, La., Duty, La., Stafford, La., Harrisonburg, La., Trinity, La., Security, La., Monterey, La., Armagh, La., Eva, La., New Era, La., Acme, La.				60		50		40		30		25		40		30		25		20		15

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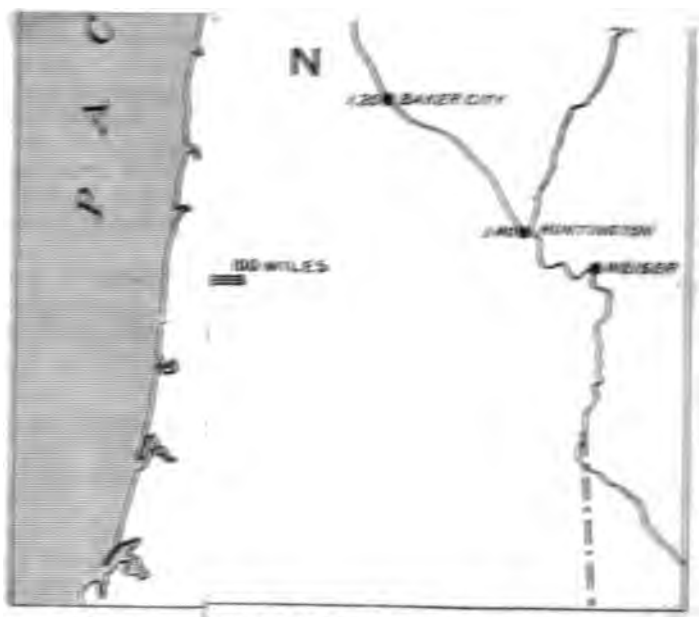
TABLE 127—*Freight rates charged for the transportation of articles (Western Classification) via rail and via water from San Francisco to points on San Francisco Bay and tributary rivers, and to interior California points (Map 8).*

[In effect on October 15, 1907.]

From San Francisco to—	Distance.		Classes, in cents per 100 pounds.																			
			1		2		3		4		5		A		B		C		D		E	
	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.	Rail.	Water.
San Rafael	15	.....	10	.....	9	.....	7	.....	5	.....	5	.....	5	.....	5	.....	5	.....	5	.....	5	.....
Petaluma	37	.....	15	14	10	9	7	6	5	5	5	5	5	6	5	5	5	5	5	5	5	4
Crockett	30	27	11	11	9	9	8	8	7	7	6	6	6	6	6	6	6	6	5½	5½	5½	5½
Benicia, Port Costa, and Vallejo [a]	33	30	12	12	10	10	8	8	7	7	6	6	6	6	6	6	6	5½	5½	5½	5½	5½
Napa	46	.....	13	.....	9	.....	8	.....	7	.....	6	.....	6	.....	6	.....	6	.....	5½	.....	5½	.....
Antioch	47	56	12	12	11	11	10	10	9	9	9	9	9	9	8½	8½	7	7	6½	6½	6½	6½
San Joaquin River Landings [b]	.....	.....	.....	22	.....	20	.....	17	.....	15	.....	14	.....	14	.....	12	.....	9½	.....	9	.....	9
Stockton	78	103	10	10	10	9	9	9	9	9	7	7	7	7	6	6	5¾	5½	5½	5½	5½	5½
Sacramento River Landings [c]	.....	.....	.....	20	.....	15	.....	11	.....	10	.....	9	.....	9	.....	9	.....	7½	.....	6¼	.....	6½
Sacramento	90	125	26	22	24	20	21	17	17	15	16	14	16	14	13	12	11	9½	9½	9	9½	9
Santa Clara	45	.....	10	.....	9	.....	8	.....	7	.....	6	.....	6	.....	6	.....	6	.....	5½	.....	5½	.....
Los Gatos	59	.....	18	.....	16	.....	14	.....	12	.....	10	.....	10	.....	10	.....	10	.....	9	.....	9	.....
Hollister	92	.....	29	.....	27	.....	24	.....	22	.....	20	.....	20	.....	19	.....	18	.....	15	.....	15	.....
Haywards	21	.....	10	.....	8	.....	7	.....	6	.....	5	.....	5	.....	5	.....	5	.....	4½	.....	4½	.....
Pleasanton	42	.....	16	.....	13	.....	11	.....	9	.....	7	.....	7	.....	7	.....	7	.....	6½	.....	6½	.....
Livermore	48	.....	18	.....	14	.....	12	.....	10	.....	8	.....	8	.....	8	.....	8	.....	7	.....	7	.....
Tracy	72	.....	10	.....	10	.....	9	.....	9	.....	7	.....	7	.....	6	.....	5¾	.....	5½	.....	5½	.....
Modesto	103	.....	17	.....	13	.....	10	.....	9	.....	9	.....	9	.....	9	.....	8¼	.....	8	.....	7¼	.....
Dixon	68	.....	26	.....	23	.....	20	.....	17	.....	15	.....	15	.....	13	.....	11	.....	9½	.....	9½	.....
Woodland	87	.....	29	.....	26	.....	24	.....	22	.....	20	.....	20	.....	17	.....	15	.....	13	.....	13	.....
Marysville	142	.....	29	.....	26	.....	24	.....	22	.....	21	.....	21	.....	20	.....	19	.....	17	.....	17	.....
Auburn	126	.....	44	.....	40	.....	35	.....	29	.....	27	.....	27	.....	20½	.....	18	.....	15½	.....	15½	.....
Colfax	144	.....	60	.....	54	.....	46	.....	39	.....	36	.....	36	.....	25	.....	22½	.....	19	.....	19	.....
Truckee	209	.....	122	.....	110	.....	92	.....	78	.....	72	.....	72	.....	37	.....	34½	.....	27	.....	27	.....
Santa Rosa	52	.....	25	.....	18	.....	15	.....	13	.....	12	.....	12	.....	12	.....	11	.....	10	.....	9	.....
Healdsburg	66	.....	35	.....	27	.....	23	.....	20	.....	18	.....	17	.....	16	.....	15	.....	14	.....	13	.....
Cloverdale	84	.....	40	.....	32	.....	28	.....	25	.....	21	.....	20	.....	19	.....	18	.....	17	.....	16	.....
Ukiah	112	.....	50	.....	42	.....	38	.....	35	.....	32	.....	31	.....	30	.....	29	.....	28	.....	27	.....
Willits	138	.....	69	.....	60	.....	55	.....	51	.....	46	.....	45	.....	44	.....	43	.....	41	.....	40	.....
Sherwood	152	.....	81	.....	71	.....	65	.....	60	.....	54	.....	53	.....	52	.....	51	.....	48	.....	47	.....

[a] Water rates apply also to North and South Vallejo; rail rates to South Vallejo, except first class, which is 13 cents, and second class, which is 9 cents.
[b] Jersey, Bouldin-Central L. and Bouldin-Schultz L.
[c] Collinsville, Rio Vista, Isleton, Walnut Grove, Courtland, and Clarksburg.



FREIGHT RATE CLASSIFICATION VIA ALL RAIL
AND RIVERS AND PUGET SOUND

S. DOC.

9. RAILROAD CONTROL OF RIVER TRAFFIC AND PRIVATE CANALS

RIVER LINES

On the Mississippi River and its tributaries the following packet lines show traces of railroad influence. It is to be noted that vessels of these lines run from St. Louis and Evansville to points on the Tennessee and Cumberland rivers, and the railroad apparently interested in such lines is the Louisville and Nashville.

The St. Louis and Tennessee River Packet Company is generally believed to be controlled by the Louisville and Nashville Railroad, although this is denied by a representative of the packet line. The Louisville and Nashville Railroad Company reports to the Interstate Commerce Commission that it owns stock in this packet company amounting to $27,700; and also reports stock ownership to the amount of $25,200 in the Tennessee River Packet Company. Capt. Lee Howell, of Evansville, Ind., one of the directors of the St. Louis and Tennessee River Packet Company, is general freight agent of the Louisville and Nashville at Evansville, Ind.

Evansville and Bowling Green Packet Company: The president and treasurer of this company is Capt. Lee Howell, who is also a director and stockholder in the same. H. P. Cornick, secretary of this company, is assistant to Mr. Howell in the Louisville and Nashville freight office at Evansville.

Evansville, Paducah and Cairo Packet Line: Capt. Lee Howell is also a stockholder in this company, which indicates Louisville and Nashville influence. The company is a successor to the Tennessee and Ohio River Transportation Company.

Ryman Line: H. W. Buttorff, president of this line, is a director of the Nashville, Chattanooga and St. Louis Railway Company, which is controlled by the Louisville and Nashville Railroad through stock ownership.

A group of railroads centering at St. Louis controls the Wiggins Ferry Company at that point, and this company in turn owns stock in the St. Louis Steel Barge Company.

PRIVATE CANALS

Delaware and Raritan: The Delaware and Raritan Canal is owned by the United New Jersey Railroad and Canal Company, all the property of which was leased to the Pennsylvania Railroad Company in June, 1871, for 999 years.

The Morris Canal was leased in perpetuity to the Lehigh Valley Railroad Company in 1871 under authority of a special act of the New Jersey legislature.

The Lehigh Canal is owned by the Lehigh Canal and Navigation Company. The managers of this company assert that the canal is operated independently of all other lines and is not connected with

any carrier engaged in interstate business. According to Moo Manual for 1907 (p. 2100) several railroad lines belonging to company are leased to the Central Railroad of New Jersey; and latter company is controlled by the Reading Company, which ov $14,504,000 of the $27,431,800 capital stock outstanding on June 1906. It also appears that three of the managers of the Lehigh and Navigation Company (Samuel Dixon, Joseph S. Harris, and I McKean) are also directors in the Reading Company.[a]

The Delaware Division Canal is now controlled by the Lehigh and Navigation Company, which owns practically all the ca stock.

The Schuylkill Navigation, according to the statement of its n ager, operates its own works, which are not leased from any rail company. The principal office of the company, however, is at Reading Terminal, Philadelphia, Pa., and out of 65,975 share preferred stock all but 106 shares are owned by the Reading C pany (the holding company for the Reading Railroad system); out of 13,270 shares of common stock the Reading Company c 12,907 shares.

The Chesapeake and Ohio Canal is now operated by two trus one of whom, H. L. Bond, jr., of Baltimore, Md., is general atto for the Baltimore and Ohio Railroad. According to Moody's Ma for 1907 (p. 296), of the bond issue of 1878, $500,000 was hel the Baltimore and Ohio on June 30, 1906, and the same auth also credits the Baltimore and Ohio with the ownership of $861 of the bond issue of 1844.

The Baltimore and Ohio Railroad Company formerly ov $5,353,200 (a majority) of the capital stock ($10,250,000) of Consolidation Coal Company of Baltimore, Md., which owns n of the boats on this canal and handles the greater bulk of tonnag

Mr. F. S. Landstreet, a director of the Western Maryland Railr acquired the interests in this canal formerly held by the Stat Maryland. But these interests were conveyed to the Contine Trust Company of Maryland in August, 1907.[b]

The abandoned Pennsylvania canals are largely controlled by Pennsylvania Railroad, which holds $3,517,150 stock in the Pen vania Canal Company, and $384,000 mortgage bonds, and in 1906 $2,006,490 of mortgage coupons.

The Central Railroad of Georgia owns $160,000 stock in the Sa nah and Ogeechee Canal Company, also an abandoned canal.

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[a] Stock Exchange Handbook, 1907, p. 266, 579.

[b] Records of the recorder of deeds, District of Columbia, vol. 3100, folio 34

10. RELATIONS BETWEEN WATERWAYS AND RAILWAY TRAFFIC IN EUROPE

By J. C. Welliver

INTRODUCTORY

GENERAL CONDITIONS

Within an area less than 800,000 square miles, comprising Austria, Hungary, Belgium, France, Holland, Germany, and Italy, there has been expended in the last half century in improvement and construction of internal waterways an amount which, if to it be added the probable cost of improvements now in hand, will aggregate probably not far from a billion dollars.

Nearly all of this vast sum has been taken directly from government revenue. Only a negligible part has been provided by private enterprise.

For the greater part, governments have made these great investments in waterways without expectation of profit or even of interest on the capital investment. Continental waterways in general have been provided as practically free public highways. Such tolls and charges as are exacted are so light as to constitute hardly an appreciable burden on traffic.

The present tendency is to divide the expense of waterway development between general government and local administrations. Various methods are adopted for dividing the burden between the general government and the provincial or municipal administration. All, however, are based on the theory that the locality immediately benefited should contribute a larger part of the investment than localities whose concern with the improvement is more remote.

The history of waterway development in Europe naturally falls into two periods. The first began nearly a century and a half ago and continued down to the time when railroad building absorbed energy and capital and brought waterway expansion sharply to an end. The second period began about a generation ago. The revival of interest in waterways, taking place at about the same period in different countries, seems to have been due to dissatisfaction with railroad conditions and to a developing opinion that best results would be secured by the exploitation of both transportation systems—rail and water.

In no country has it been possible to secure satisfactory development of both systems until one was protected against the other. As a rule it has been necessary to invoke the power of the state to save the traffic of waterways from destruction by railway competition.

It is believed, however, that fair consideration will convince any candid student that this fact by no means demonstrates the impracticability or the economic inutility of waterways. The reasons for this belief will be developed hereafter.

Those countries which have taken most pains and gone to greatest expense to improve and systematize waterways, and which have most carefully protected them in a share of traffic, are fully committed to the policy of developing both rail and water transportation side by side, as complements one of the other.

Experience has convinced these countries that the best and most economic transportation is to be secured only by thus maintaining both systems at high efficiency.

It is universal experience that development of waterways, resulting in a great increase of their tonnage, does not injure the traffic of railways. Instead, the railways themselves appear to have actually benefited by the expansion of the waterway systems, because with each extension of facilities traffic has increased in still larger proportions. Thus is the remarkable showing made of railroad traffic increasing by leaps and bounds at the very time when waterways were most highly improved and constantly adding to their tonnage.

Development of water transportation has greatly reduced freight charges, induced industrial and commercial development, and contributed vastly to prosperity and wealth.

So firmly is the conviction now established that waterways contribute to national prosperity that those countries in which the Government owns the railroads are foremost in developing waterways. There is thus afforded the curious spectacle of a group of States, having many billions invested in publicly owned railroads, building another system of transportation to compete with the railroads, and turning over this competing system to the substantially free use of the community. More remarkable still is the universal testimony that this policy has paid both in increased railroad profits and in added national prosperity.

Great Britain is the one exception among European industrial countries to the rule of encouraging both rail and water transport. British railroad policy has aimed at the suppression of waterway competition, and has pretty thoroughly succeeded. To-day the British business community finds itself paying higher transportation tolls than continental countries, and because of this fact is at a great and increasing disadvantage in competitive markets.

So serious has this situation come to be considered by British traders that Parliament has taken cognizance of the demand for rehabilitation of waterways, and a careful inquiry into the entire subject of water and rail transportation is now being carried on by the board of trade.

It seems interesting and significant that Great Britain and the United States are the only industrial countries of the first class in which water transportation has so long been neglected; and it is a suggestive fact that in both these countries a powerful opinion has lately developed in favor of following the lead of continental nations, emancipating the waterways from railroad domination, and vigorously developing them as an independent factor in transportation.

EARLY CANAL ERA ENDED BY RAILWAY DEVELOPMENT

Before the perfection of the steam locomotive and the introduction of railway transportation there had been an era of canal development in most important countries. It is safe to say that if the

railroad had not been developed until a generation later than it actually was, the system of canals and regulated rivers would now be much more extensive and perfect than it is.

After the railroad had demonstrated its superior adaptability to the conditions of the times there was a long period of quiescence in waterway development, and it was not until the seventh and eighth decades of the last century that public attention reverted to the possibilities of inland water communication. About this period there came a general revival of interest in the subject throughout the progressive countries of continental Europe, although in England and the United States the revival was postponed much longer.

The development of railways had made transportation vastly more important than ever before, and at the end of the first generation of railroad experience there began to grow up a strong impression that while railroad transportation was vastly cheaper and more satisfactory than in its beginning anybody had imagined it could be, it was yet more expensive than was compatible with the best interest of the business community. This impression, together with the rapid development of industrial competition, both internal and international, was responsible for the revival of interest in canals and rivers, which it was believed had been unduly neglected and which promised to give cheaper transportation, especially for bulky products of comparatively low value, than could be secured by rail.

In countries where railroads have been state owned, the government has most promptly and vigorously interested itself in the development of canals which should compete with the railroads. Canal and river transportation has been least developed, and with the least satisfactory results, in Great Britain and the United States, the two first-class commercial countries which have never departed from the rule of private railroad ownership. In both these countries competition between waterways and railroads resulted disastrously to canals and river navigation. The vast aggregations of capital which were brought together to finance the railroads were, in private control, powerful enough largely to suppress competition by the waterways. As a result, in one way and another, many important canals in Great Britain and the United States have fallen into the hands of railroads and have become comparatively negligible factors in the transportation scheme. Many have been converted into rights of way for railroads, and few have been improved so that they could have a fair chance in competing with the railroads. The impression was that canals and rivers would never be able satisfactorily to compete against railroads, and the decadence of internal waterways was regarded as inevitable and of no serious economic consequence.

REVIVAL OF INTEREST IN WATERWAYS

About forty years ago public opinion began to interest itself once more in inland water transportation, particularly on the continent. The impression became strong that if the railroads were permitted permanently to monopolize inland transportation the problem of raising capital for the necessary expansion of the railroad system would become increasingly serious. Therefore, two considerations moved the authorities, especially in countries where the railroads were owned by the state, to a renewed study of the possibilities of

water transportation. First, perhaps, was the growing belief that for many classes of freight water would provide equally satisfactory transportation at less rates than the railroads. Only second to this was the impression among state officials, who faced the problem of raising money for extensions and improvements of railroads, that a given investment in the improvement of rivers and in connecting them by canals would provide means for moving a larger tonnage of freight than an equal investment in railroad facilities.

The results achieved thus far through the rehabilitation of the internal waterway systems of continental countries are generally accepted as justifying this opinion. Even in Great Britain, where distances are comparatively short, and where no important industrial center is very far removed from the cheapest transportation in the world—that by ocean—there is now a belated but animated concern in behalf of the waterways, and commercial interests are making themselves very active in the effort to enlist the state.

It was doubtless only natural that in Great Britain and the United States the waterways revival should have been postponed longer than in continental countries. It is fashionable to attribute the delay in these two countries to the influence of the railroads, and no doubt this was a factor of importance. But other considerations must be assigned due weight. In England the most important consideration was the easy accessibility of ocean transportation; and second was the fact that for various physical reasons the construction of canals is more difficult and expensive in England than in most continental countries. England has no such great rivers as the Danube, the Rhine, the Elbe, the Oder, the Seine, and other great water highways of the Continent. The topography of Great Britain makes canal construction more difficult than on the Continent. The country is more uneven and more locks would be required, involving greater expense. The question of water supply for the higher levels is so serious as in the opinion of some authorities to bar Great Britain from ever securing economically a system of waterways approaching the efficiency of those in France, Belgium, the Netherlands, Germany and even Austria-Hungary.

TARDY WATERWAY REVIVAL IN GREAT BRITAIN

Yet freight rates imposed by the railroads are so high that despite difficulties the demand for waterways is now becoming insistent. While it is impossible, owing to the fact that British railroads have never provided ton-mile statistics, to determine accurately how English railroad rates compare with those of other countries, it is accepted in Great Britain that the average cost of moving freight there is greater than in any other industrial country. Various witnesses on behalf of the traders, who appeared before the Royal Commission on Internal Waterways, presented statistics on this point, not always in agreement, but uniformly reaching the conclusion that English transportation is the most expensive in Europe. The handicap which this extra expense imposes on British industry and agriculture is recognized and has been constantly referred to in these hearings. The English industrial community is not agreed as to a plan for rehabilitating the waterways, but most of the proposals agree that the matter must not be left to private enterprise; that the

canals must be divorced from the railroads and that in some manner there must be a grant of public credit to finance the rehabilitation. Whether this extension of public credit should be made directly by the Government of the United Kingdom, or whether the capital should be raised on the responsibility of local taxing bodies, or whether, as is now the rule in the Commonwealth, the burden should be divided between the general and local government bodies, is matter of divided opinion. Officials of the river commissions have manifested reluctance as to the recommendations they are likely to make. But the impression is strong that their report will make some concession to the demands for improved waterways.

SITUATION IN THE UNITED STATES COMPARED

It has been said that in both England and the United States the railroads have probably been largely blamed for suppressing the development and the development of waterways. The reasons for this belief as to England have been suggested. As to the United States a different set of reasons probably should be assigned. In the first place the vast area and comparatively sparse population of the United States for a long time seemed to justify the belief that it would be time less than waste of money to develop two transportation systems side by side. The population until recent years was too thin to secure transportation facilities enough to move the traffic, too thin to secure traffic enough to make the transportation facilities profitable. As railroads could go into all sections, while inland waterways necessarily were limited in this respect, it was natural that the railroads should have the preference. Moreover, as to the great American rivers—vastly greater and more potentially useful in transportation than the rivers of Europe—their winding and commercial utility constantly decreased because the railroads were willing to take the traffic and had recent years adjusted rates facilities for moving it. To-day however the United States faces an entirely different situation. Many of the railroads have been unable to meet the demands upon them, and influential managers of railroads have lately insisted that it was absolutely necessary that waterways be developed to complement the railroad system of transportation.

Finally, as a further and most important reason why artificial or semi-artificial means of water transportation have been neglected in the United States, may be stated the simple fact of the existence of the Great Lakes. In these natural lakes has provided a transportation highway with which neither railroads, rivers, canals, nor combined rivers, nor any combination of the four, can possibly be compared. The tremendous tonnage moved on the Great Lakes and its marvelous development are regarded by European transportation authorities as among the wonders of the world. Considering the cheapness and unlimited capacity of the Lakes on the one hand, and the density and universality of railroad transportation on the other, it is small wonder that the possibilities of rivers and canals were long unappreciated.

RISE OF THE BATTLE LAW WATERS

More than twenty years ago an English authority of commercial eminence visited the United States to investigate the subject of the Irish

and steel business in this country. On his return home he gave assurances to British iron manufacturers that they need have no serious fears of the competition of the United States, because in America the great iron ore deposits were too far distant from coal. He was positive it would never be possible to bring the ore to the coal, or the coal to the ore, at such rates as would enable production of iron and steel cheap enough to compete with England.

How completely erroneous was this conclusion need not be suggested now, because everybody is familiar with the marvelous facilities for bringing the Lake Superior ores to the Pittsburg iron district, and with the success of the American iron and steel interests in competing with all the world, despite the initial disadvantages which they had to overcome. Witnesses before the British Royal Commission repeatedly declared that the process of bringing the Lake Superior ores first by rail to the docks on the upper Lake, then by Lakes Superior, Huron, and Erie to ports convenient to the coal districts, and finally by rail to the seats of the iron industry, was the greatest achievement in transportation that the world has seen.

So much for the British iron-makers' error in underrating the possibilities of internal transportation in the United States. As to Germany, their error was hardly less striking. In the beginnings of the great development of the German iron trade English iron interests declined to take German competition seriously because the German ore deposits were considered utterly inadequate for the development of a really great industry, and it was presumed that the transportation of great quantities of foreign ore to the seats of the German industries would be so expensive as to make it utterly unprofitable. Yet, in fact, the Germans have developed an iron industry which is now a matter of concern to every competing country, and which is based, like that of the United States, on a system of extremely cheap transportation. While there is a large and increasing production of iron ore in Luxembourg, which is utilized in the German iron industry, and while Germany itself produces a large and growing annual tonnage of ore, and brings still other large amounts from Austria-Hungary, it is nevertheless true that the major part of the iron ore reduced in Germany comes from the Scandinavian peninsula and from Spain. To the canals and canalized rivers of the Empire is due the credit for making it possible thus to bring foreign ores to the German industrial regions. Exceedingly low rates are made and the tonnage handled by rivers and canals is tremendous.

Thus it appears that in both the United States and Germany the development of the utmost possibilities of cheap inland water communication is entitled to recognition for having made possible the upbuilding of industries which a generation ago seemed economically impossible. With their great supplies of coal and ore located very close together, and with ocean transportation at their door, British manufacturers seemed assured of a domination in the world's iron trade that could only be ended by exhaustion of their supplies of coal or iron. A very different situation has been brought about largely because of the utilization of internal water transportation in the United States and Germany. This one object lesson has deeply impressed the British community, and in no small measure has been responsible for the present agitation of the waterways question.

WHY WATERWAYS MUST BE PROTECTED FROM UNREGULATED RAILWAY COMPETITION

It has been suggested that in both Great Britain and the United States the railroads have been charged with more than their real part of responsibility for preventing development of internal waterways, yet the fact remains that it is in those countries which have government ownership of railroads, and where governmental policy has prevented the developing waterway systems from ruinous competition with the railways, that the waterways have been developed to the greatest extent and efficiency.

The fact that in different countries it has repeatedly been found necessary to adopt vigorous measures to prevent the railroads from destroying the business of internal waterways by the simple process of hauling freight more cheaply than it could be moved by water, must be met by the advocates of waterway development. It is a fact which must be explained away in any effective argument in favor of water transportation as against railways. The truth is that in Germany, in France, in Belgium, three countries whose waterway systems have reached highest perfection, as well as in Britain, the railroads have proved their ability to take the tonnage away from water routes and to keep it away from them. The railroads have done this, too, in the face of the fact that they were required to earn not only their operating expenses but heavy charges on capital debt, while the canals were operated in the main free of charge. While freight by rail must pay not only the expense of running the train, but also the charge for maintenance of roadway and interest on capital invested, practically the only expense attached to water transportation has been that for mere operation of boats and barges. The water highway has been provided at Government expense. Commerce moving on it has not been expected to remunerate the Government or even to pay interest on capital. With the railroads thus handicapped, if the waterways could not take care of themselves the burden is upon waterway advocates to prove the waterways' economic right to survive.

This can not be too fully understood or too carefully studied by advocates of water transportation. In any analytical consideration of the difficulties of internal water transport the experience of European countries is certain to be presented, to be emphasized in many ways, and to demand satisfactory explanation. It is proposed now to suggest some reasons why the inability of water highways to compete against the unrestricted competition of railways is not necessarily a demonstration that water transportation is economically wasteful compared to rail.

The case for water transportation can not be stated in a few sentences. It is necessary to recall something of transportation history. It has already been pointed out that there was a considerable development of water transportation in many countries before the railroad came. The canals of that earlier era were small, and while they represented a vast improvement over any facilities that had previously existed, nevertheless, with their small ranges, their shallow draft, and numerous locks, they were not fitted for competition with the railroad. Furthermore, while engineering skill has made it pos-

sible to carry the railroad practically everywhere—tunneling mountains, spanning great rivers, burrowing under arms of the ocean, overcoming every obstacle—no skill and no expenditure could carry waterways into many regions which railroads could enter. Consequently, if the two systems, water and rail, had been started in an even competition, water would have been placed at a great and irremovable disadvantage. The railroad could reach every market and every industrial center; not so the water.

Now it must be borne in mind that at the time, three-fourths of a century ago, when the industrial world seemed called upon to determine which system of transportation it would accept and develop, there was no conception of the tremendous part transportation was to play in the future. The wildest visionary would not have dared predict that by the dawning of the twentieth century the tonnage of freight would be even a small fraction of the immense amount that now moves. The idea that Europe and North America would be gridironed with hundreds of thousands of miles of railroads, moving billions of tons of goods, would have been scouted. At that time it was assumed that commerce made transportation, the idea that transportation makes commerce was of later development. The possible development of both the consuming and producing capacities of great populations was utterly unsuspected. Nobody dreamed that commerce would soon demand all the accommodations that both rail and water could provide. It seemed a mere question of choosing between two systems of transportation, and naturally the one which offered the widest range of usefulness was taken up.

So for several decades waterways were neglected and energies devoted to railroads. These at first were local enterprises, lines were short, and there was little thought of developing great systems. But as time passed and commerce expanded with the growth of facilities, local roads were joined into systems, systems were federated into groups, and presently the marvel of the modern railroad fabric had been wrought. Railroads were everywhere, they could handle everything; they made transportation inconceivably cheaper, safer, and more expeditious than ever before. So it came about that in a short time railroads had reached magnificent efficiency and approximate universality, while waterways had ceased to develop and had become less and less factors in transport. Then came the era of attempted waterway rehabilitation.

Conviction that while railroads had wonderfully cheapened transportation, waterways would still further reduce this charge, was partly responsible for the revival of interest in waterways. Railways had learned the art of suppressing competition among themselves. Abuses had grown up. Because of these, dissatisfaction with railroad conditions developed in many countries about the same time. The epoch of "granger legislation" in the United States was synchronous with a period of very similar agitation in Germany. In the latter country the agitation resulted in nationalization of railroads. In the United States it initiated the movement for government control.

Incident to this granger movement in Europe was the recrudescence of waterways. In different countries about the same time effort was made to improve and extend the waterway system so that it should supplement the railroads and induce reduction of their rates.

At this time there was no comprehension of the fact that commerce tends to increase in something like the proportion that facilities for transport are expanded. Railroad managers believed that if waterways were developed they would take away a share of the freight and to just that extent the railroads would suffer. Nobody was yet prepared to believe that business taken from the railroads would be promptly replaced by new business, and that this growth, keeping pace with extension of transportation facilities and lowering of rates, would go on indefinitely.

Railroad managers had no sympathy with the idea that larger transportation facilities were demanded, or that another method would supply cheaper transport than their iron highways. Their political influence as well as their vastly more important commercial influence was enlisted in antagonism. They believed it would be better to spend money in building new railroads or improving old ones rather than in waterways. They were determined to prove the correctness of this opinion, and they set about doing so by inaugurating a cutthroat competition against the waterways under circumstances in which the latter were at a hopeless disadvantage. The nature and extent of this disadvantage must now be explained.

The railroad system was already constructed and in business. It enjoyed a practical monopoly. Everybody was compelled to patronize it. Its business was vast and varied. No statistician could calculate accurately the cost of handling a particular class of business or a particular consignment. As to a great part of the territory, where waterways could not enter, the railroad's monopoly was unassailable. Likewise, as to a large proportion of business the railroads were assured a monopoly because of quicker and surer service. The highest classes of freight, which produced the greatest revenue in proportion to expense of moving, were conceded to the railways. The waterways were limited to a competition for the lower classes of freight, hauled at the lowest rates, and throughout only a limited region.

Therefore, when the minister of railways of a government-ownership country, or the traffic manager in a private-ownership country, set out to prove that water transportation was not economical in comparison with rail, they had every advantage. They made such rates as they saw fit to prevent traffic going to the waterways. If they lost money on hauling one class of freight they could make it up on another class for which the waterways could not compete. If the railways of the north of France found that their coal tonnage was being lost to the canals, they could reduce their rates to such a point that the canals could not compete; and if in so doing they lost money on coal traffic they could make it back by charging higher rates on other business which the canals could not touch; or they could stand a net loss for a considerable time without being driven out of business.

On the other side of this uneven competitive game was the operator of the canal boat. He did not own his highway. His investment was limited to his barges and mules. He was assured of absolutely no business against the railroad's competition. He had no great financial backing, as the railroad had, to enable him to carry on a long and arduous fight. He must earn a living profit on his business to-day in order to do more business to-morrow. If he were

forced to lose money to-day and to-morrow he would be out of business the day after to-morrow. Before the railroad would feel a strain which it was able to distribute throughout a complex business structure every part of which helped support every other part, the bargeman would be bankrupted and driven from the field.

So much for the one aspect of competition between the railway and the waterway. Another aspect is suggested by the case of a manufacturer whose plant is located adjacent to both water and rail routes, and who wishes to divide his business between the two. He can reach part of his markets by water. He can reach all of them by rail. He may be able to make a contract for bringing his coal and raw materials to his establishment by water at low rates. But if the railroad, jealous of his division of business, is permitted to retaliate it can punish the manufacturer so effectively that he will not dare make the division. In actual experience this very thing happened repeatedly in different countries at times when the railroads were permitted to fight the canals.

The railroad would offer as good a rate as the canal had made, whether or not it was remunerative. If the manufacturer still declined to give all his business to the railroad, the traffic manager could then say: "Very well, your distributing rates will be so high, and your supply of cars so inadequate, that you will hereafter find difficulty in distributing your products to markets which the waterways do not reach. Your competitor, who is wiser and realizes the propriety of giving his entire business to us, will be able promptly to fill orders at times when you will be unable to get service. As he gives us his entire business we shall feel under obligations to give him consideration which you can not expect."

Preferential rates constituted at times the most effective method of bringing recalcitrants to time. In France railroad managers employed these various expedients with great effect, frequently granting much lower rates to one customer than to another in the same town, favoring the one whose business was given entirely to the railways. The government railway administration found it necessary to make a regulation that if the rate were reduced at a given point on any part of the business it must be reduced on all. This was one of the effective means of protecting the canals in their fair share of the business.

In many cases railways are now forbidden by the state to make as low rates as the canals. The fact that in Germany, France, and Belgium this intervention is necessary in order to protect the canals in their proportion of traffic, is always emphasized in railroad arguments. But the state's policy, where states own and operate the railways, is primarily to facilitate business, rather than to monopolize it. Experience has taught that it is not good business for the railways to be allowed to monopolize traffic by hauling it at unremunerative rates. The state insists upon maintaining both transportation systems in effective operation, on the theory that in the long run business will go to that system which can most profitably handle it. The public is accommodated and the waste of competition avoided. Such competition at best would be useless, because after making a low rate to get the business the railroad would either have to continue doing it at a loss—which would be a waste of the state's property—or else it would have to raise the rate again and leave the public worse off than ever.

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[illegible]

[illegible]

IF THE OHIO HAD BEEN A GERMAN RIVER

Opponents of the economic policy of waterway development, believing water can not ultimately compete with railroads, frequently point to the decadence of traffic along the Ohio River in the face of the fact that much money has been spent improving that stream. The facts support the contention that the great Ohio seems to have been unable to compete satisfactorily against the railroads. But in no great European country, where state control of such matters is more firm than here, would competition have been allowed to ruin the traffic on a great artery like the Ohio. The State would maintain that instead of building railroads to handle traffic which could as well be moved by river, it would better leave this traffic to the river and spend its money building railroads in regions where it was impossible to furnish any but rail transportation. German or French policy would never have permitted the Ohio, the Mississippi, the Missouri, to fall into commercial decadence. If these had been German possessions, for instance, they would long ago have developed almost unlimited carrying possibilities, and to-day would be doing for this country what the Elbe, the Oder, the Weser, the Rhine, and others are doing for Germany. They would be preventing car famines and insuring against the paralysis of trade which follows when transportation facilities become inadequate.

European students of transportation wonder that the United States should have permitted so one-sided a development of its transportation system. They point out that with perhaps the exception of China, no other country has such a magnificent river system as the United States, or so great possibilities of its effective utilization. Nowhere else is there so large a proportion of freight which can be moved most advantageously by water. In another place it has been suggested that if the German Empire controlled the world's supply of a great staple, as the United States controls cotton, German economic policy would busy itself to bring about the manufacture of a vastly larger proportion of that raw material in Germany. And, similarly, if Germany, France, or Austria possessed such a river system as that of the United States, with possibilities of being joined to a lake system such as ours, these would long ago have been made the basis of a vast and busy transportation system.

One consideration which has been kept in mind in European development of water transportation is that when a great water route is once opened its capacity for freight movement is almost unlimited. The possibility of traffic movement on a single-line railroad is definitely limited. When that capacity is reached the road must be double-tracked. On the other hand a great waterway can move increasing amounts of freight to an almost indefinite degree with merely the provision of additional boats and barges. So the policy of Germany and France in recent years has been to make important internal waterways as large as practicable. Originally small canals were supposed to be ample for all the traffic likely to be offered them; but with the development of commerce and industry they proved too small. They have been rebuilt, shortened, channels deepened and widened, the number of locks reduced, and their capacity increased. The scheme of construction looked to the future. If these great investments in water-

EASTERN DIVISION OF WATERWAY SYSTEM

It has been said that this Canal du Centre is to connect the eastern and western divisions of the Belgian national waterways system. The eastern division is considerably the smaller and in a general way is bounded on the west by the canals which pass through Brussels running north and south. One is known as the Charleroi-Brussels Canal and the other as the Brussels-Rupel. These two canals, together with the Rupel and lower reaches of the Scheldt River, the Canal de Jonction de la Meuse à l'Escaut, the Maastricht-Bois-le-Duc, and the Maastricht-Liege canals, with the Meuse and Sambre rivers, make up a circuit which connects the industrial centers of Brussels, Charleroi, Namur, Liege, Maastricht, Holland, and Antwerp. Communication is secured between the Charleroi coal fields, the zinc and lead deposits of Liege and Namur, and the stone deposits about Liege and in the region between the Meuse and Sambre rivers. This circuit crosses the eastern industrial district. There are minor canals subsidiary to these main ones.

Connected with the canals of this circuit, and running outward from it, are the Turnhout-Antwerp Canal; the River Ourthe, which accommodates navigation into a region of extensive quarries; and the River Meuse, joining Belgium to the northeastern part of France, and employed for transportation of coal to France, of timber from France to Belgium, of marble from the French quarries to Belgium, and of all sorts of miscellaneous traffic. Finally, the Sambre River intersects this canal circuit and connects it, by way of an important coal region, with Paris.

THE WESTERN DIVISION

The western and larger division of the Belgian system is a network of canals and improved rivers, bringing the coal fields of Mons, northern France, into easy communication with the industrial and agricultural regions of Hainault and Flanders. A glance at any map of this region, on which the Canal du Centre is indicated by dotted lines, will show how necessary was the construction of this last-named work as a means of connecting the two Belgian divisions.

Antwerp, being the great port and commercial center of Belgium, as well as the third port of the world in tonnage handled, receives the greater part of the country's supply of raw materials and goods from abroad. From Antwerp these are distributed by rail and waterways to the industrial districts, whence they are returned in the form of manufactured products. There is practically no district in Belgium which, by reason of remoteness from markets, or expensive transportation, is unavailable for industrial development. Belgium has most intelligently, persistently, and effectively striven to get cheap transportation, and to promote industry and commerce. Writing of the workings of the Belgian waterways system Consul-General Herstet, representing Great Britain at Antwerp, in a report that has been accepted as one of the best discussions of the subject, says, in part:

> The gradual but steady growth of a modern canal system, intended for and serving as an auxiliary to the railways—which are, for the most part, under State control—has rendered transport as cheap as possible, and by this means the Belgian manufacturer has been enabled to compete in most advantageous terms with his foreign rivals.

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The results achieved thus far through the rehabilitation of the internal waterway systems of continental countries are generally accepted as justifying this opinion. Even in Great Britain, where distances are comparatively short, and where no important industrial center is very far removed from the cheapest transportation in the world—that by ocean—there is now a belated but animated concern in behalf of the waterways, and commercial interests are making themselves very active in the effort to enlist the state.

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EASTERN DIVISION OF WATERWAY SYSTEM

It has been said that the Canal du Centre is to connect the eastern and western divisions of the Belgian national waterways system. The eastern division is overwhelmingly the larger and in a general way is bounded on the west by the canals which pass through Brussels running north and south. One is known as the Charleroi-Brussels Canal and the other as the Brussels-Rupel. These two canals, together with the Rupel and lower reaches of the Scheldt River, the Canal de Jonction de la Meuse à l'Escaut, the Maastricht-Bois-le-Duc, and the Maastricht-Liège canals, with the Meuse and Sambre rivers, make up a circuit which encloses the industrial centers of Brussels, Charleroi, Namur, Liège, Maastricht, Helmond, and Antwerp. Communication is secured between the Charleroi coal fields, the zinc and lead deposits of Liège and Namur, and the stone deposits about Liège and in the region between the Meuse and Sambre rivers. This circuit includes the eastern industrial district. There are minor canals subsidiary to these main lines.

Connected with the canals of this circuit, and running outward from it, are the Turnhout-Antwerp Canal, the River Ourcq, which accommodates navigation into a region of extensive quarries, and the River Meuse, joining Belgium to the northeastern part of France, and adapted for transportation of coal to France, of timber from France to Belgium, of marble from the French quarries to Belgium, and of a score of miscellaneous traffic. Finally, the Sambre River interrupts this main circuit and connects it by way of an important coal region with Paris.

THE WESTERN DIVISION

The western and larger division of the Belgian system is a network of canals and important rivers, bringing the coal fields of Mons, northern France, and easy communication with the industrial and agricultural regions of Hainaut and Flanders. A glance at any map of this region, in which the Canal du Centre is indicated by dotted lines, will show how convenient was the construction of this last-named work as a means of connecting the two Belgian divisions.

Antwerp, being the great port and commercial center of Belgium, as well as the third port of the world in tonnage handled, receives the greater part of the country's export of raw materials and goods from abroad. From Antwerp these are distributed by rail and waterways to the industrial districts, whence they are returned in the form of manufactured products. There is practically no district in Belgium which, by reason of remoteness from markets or expensive transportation, is unfavorable for industrial development. Belgium has most adequately, persistently and effectively striven to get cheap transportation and to promote industry and commerce. Writing of the workings of the Belgian waterways system Consul-General Harrison, representing Great Britain at Antwerp, in a report that has been adopted as one of the best discussions of the subject, says in part:

> The practical use made of a network canal system, adapted to and serving as an auxiliary to the railways—which are, for the most part, under State control—has enabled manufacture as cheap as possible and by this means the Belgian manufacturer has been enabled to compete in most advantageous terms with his foreign rivals.

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canals must be divorced from the railroads; and that in some manner there must be a grant of public credit to finance the rehabilitation. Whether the extension of public credit should be made directly by the Government of the United Kingdom, or whether the capital should be raised on the responsibility of local taxing bodies, or whether, as is now the rule on the Continent, the burden should be divided between the general and local government bodies, is matter of divided opinion. Officials of the royal commission have manifested reticence as to the recommendation they are likely to make, but the impression is strong that their report will make some concession to the demand for improved waterways.

SITUATION IN THE UNITED STATES COMPARED

It has been said that in both England and the United States the railroads have probably been justly blamed for suppressing the competition and the development of waterways. The reasons for this belief as to England have been suggested. As to the United States a different set of reasons probably should be assigned. In the first place the vast area and comparatively scarce population of the United States for a long time seemed to justify the belief that it would be little less than waste of money to develop two transportation systems side by side. The problem, until recent years, was not only to secure transportation facilities enough to move the freight, but also to secure freight enough to make the transportation facilities profitable. As railroads could go into all sections, while inland waterways necessarily were limited in this regard, it was natural that the railroads should have the preference. Moreover, as to the great American rivers—vastly greater and more potentially useful in transportation than the rivers of Europe—their tonnage and commercial utility constantly decreased because the railroads were willing to take the freight and until recent years afforded ample facilities for moving it. Today, however, the United States faces an entirely different situation. Many of the railroads have been unable to meet the demands upon them, and influential managers of railroads have lately insisted that it was absolutely necessary that waterways be developed to supplement the railroad system of transportation.

Finally, as a further and most important reason why artificial or semi-artificial means of water transportation have been neglected in the United States, may be stated the simple fact of the existence of the Great Lakes. In some sense nature has provided a transportation highway with which neither railroads, rivers, canals, nor canalized rivers, nor any combination of the four, can possibly be compared. The immense tonnage moved on the Great Lakes and its marvelous development are regarded by European transportation authorities as among the wonders of the world. Considering the cheapness and unlimited capacity of the Lakes on the one hand, and the celerity and uniformity of railroad transportation on the other, it is small wonder that the possibilities of rivers and canals were long unappreciated.

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Bruges, large seagoing vessels may be accommodated. From Bruges inland to Ghent it has likewise been widened to accommodate the largest barges carried on the Rhine.

There is a canal under construction from Bruges to Zeebrugge, a little over 6 miles, which enables ocean-going vessels of draft up to 27 feet to go up to Bruges. A great breakwater has been constructed at Zeebrugge to protect the entrance to this canal. This Bruges-Zeebrugge canal is owned by a private company under close Government control.

DIGGING OUT INLAND HARBORS

The business of scooping out huge inland harbors at such points as Bruges and Ghent to accommodate the great ocean-going vessels which these canals bring up to the cities is quite a matter of fact in Belgium. Each increase in the capacity of one of the ship canals involves extension of the inland harbor, so that vessels may be assured ample docking facilities. There seems almost no limit to the willingness of the Belgian cities and Government to spend money on these facilities for a fast-expanding commerce. Americans have come to view with reasonable equanimity the generous appropriations which Congress makes for river and harbor improvements, but if Congress should pass a river and harbor bill which looked to the initiation of a scheme of improvement that was comparable, considering the size and wealth of the two countries, with that on which Belgium has been engaged for many years, it is safe to say that the country would gasp when it saw the figures. Yet Belgium finds the investment profitable. Somewhere from $10,000,000 to $15,000,000 will have been spent when the entire scheme of bringing up great seagoing vessels to Bruges is completed.

A feature of the great seaway from Bruges down to Zeebrugge is its illustration of how the railways and canals of Belgium work hand in hand. Along the side of the canal runs a 3-track railroad line, designed to bring up passengers and freight from the seacoast in cases where more prompt transportation is desired than the canal can afford.

Even Brussels, which on any map has the appearance of being an inland city, has had the sea brought to its door by a canal. For many years small seagoing vessels have made trips from Brussels, doing coasting trade to all the points touching on the North Sea. Some years ago a project was adopted which looked to the enlargement of the canal from Brussels to Rupel, to 18 feet deep. On this enlarged canal are 4 locks of immense size: and another harbor is being dredged out to accommodate the traffic. This new canal for ocean-going vessels in turn connects with the big inland ditch from Brussels to Charleroi, one of the most important waterways to Paris, so that transshipment of goods will be made easy and economical. Another inland seaport of no small importance is Louvain, east of Brussels, which is connected with the ocean by the Louvain Canal, navigable for seagoing boats of 500 tons.

COMPARISON OF WATER AND RAIL RATES

The following comparison shows rates by the waterways before and after the great improvements of recent years, and also rail rates:

Table of freight costs—Coal

[Per ton]

From—	To—	Distance by canal.	By canal. 1888.	By canal. 1905.	By rail, 1905.[a]
		Miles.			
Antwerp	Cologne	256	$1.59	[b] $0.54	$1.54
Do	Mannheim	418	2.20	[b] 1.08	2.88
Do	Strasburg (via France)	504	.....	[c] 2.10	2.64
Do	Strasburg (via Rhine)	500	.....	[b] 1.44	2.64
Do	Charleroi	87	.56	[c] .55	.80
Do	Liege	98	.66	[c] .66	.84
Do	Mons	105	.70	[c] .60	.82
Do	Paris	287	.....	[c] 1.68	2.77
Charleroi	Brussels	45	.49	[c] .45	.71
Do	Ghent	110	.72	[c] .65	.72
Do	Nancy	270	1.41	[c] 1.20	2.04

[a] In 10-ton loads. [b] In 50-ton lots. [c] In full loads.

The international systematization of waterways throughout Belgium, Holland, Germany, and France has been hardly less important than the development of international relations by which railroad transportation is governed. Under the workings of the Bernese convention of 1890, the railways of nearly all continental Europe are now operated practically as one system. Likewise, by reason of various international arrangements for uniform and continuous development of waterways, the river and canal systems have been linked together in an international network. Because it so graphically suggests this international cooperation in systematizing water routes, the following computation of important direct waterways, in which Belgium, France, Germany, and Holland are all represented, is here included.

Table showing chief transit and direct trade routes

Name of route.	Via—	Length.	Barges. Maximum draft.	Barges. Maximum length.	Barges. Maximum beam.	Barges. Maximum tonnage.	Tolls per ton mile.[a]	Locks.
		Miles.	*Ft. In.*	*Ft. In.*	*Ft. In.*			
1. Antwerp to Paris.	In Belgium In France	97¼ 200	5 10	125 0	16 3	350	$0.0006212 .001553 .002485	40 58
2. Antwerp to Strasburg.	Liege (in Belgium) France	170¼ 335	4 7	111 0	16 3	350	.0004973 .0007757 .001553	46 153
3. Antwerp to Strasburg.	The Rhine	500¾	6 0 9 0	384 0	50 3	None.	.....	2
4. Antwerp to Cologne.	....do	256¼	7 0 11 3	384 0	50 0	None.	.....	2
5. Antwerp to Rotterdam.	Dutch canals: In Belgium In Holland	143¼	6 2 [b] 5 4½	160 0	16 3	350	.0007757 .001553	5 22
6. Antwerp to Dunkirk.	In Belgium In France	128¼ 8	4 3	129 0	16 3	150	.0006212 .001553	5 1
7. Antwerp to Charleroi.	Brussels	76¼	5 10	61 0	6 6	70	.01397 .001553	60
8. Antwerp to Charleroi.	Liege	174¼	5 10 [b] 5 4½	130 6	16 3	300	.0004973 .0007757 .001553	48
9. Dunkirk to Charleroi.	In France In Belgium	8 137¾	4 7	119 0	16 3	150	.0004973 .0001553	1 [c] 70
10. Charleroi to Paris.	In Belgium In France	24¼ 190¾	5 10	121 0	16 3	300	.0004973	11 60
11. Charleroi to Strasburg.	In Belgium In France In Germany	64 268 67	..... 5 10 4 7	..... 124 0 111 0	..... 16 3 16 3	..... 300	..... .0004973	20 69 64

[a] "Tolls" here means the charges imposed for use of the waterways. It does not include charges of the barges for haulage. [b] For steamers. [c] Also for lifts.

WATERWAYS RELATION TO FOREIGN TRADE

The foregoing computation presents an idea of the economy in transportation effected by the expansion and improvement of European waterways. That the business community has been ready and glad to avail itself of these economies is shown by the statistics of the tonnage handled in Belgium by the different classes of transportation facilities. Sixteen years ago, of imports into Belgium, it was calculated by the Government authorities that 49.8 per cent came by sea, 43.5 per cent by land and rail, and 6.7 per cent by canal and river. Since that time the proportion received by sea and by rail has been falling off, and the proportion received by canal and river has been steadily increasing until now, on the basis of the latest official reports, it is estimated that about 25 per cent of import traffic is handled by canal and river, the other 75 per cent being approximately equally divided between rail and ocean.

In export tonnage, the showing for inland waterways is even better. In 1891, 40.5 per cent of exports were handled by sea, 47.8 per cent by rail, and only 11.7 per cent by canal and river. These figures have so far shifted that while it is not possible to give official statistics of the present relative division, it is estimated that about one-third of the total export tonnage is now handled by canal and river, and of the other two-thirds, the division considerably favors the railroads as against the sea. It appears that the proportion carried by rail has continued most nearly constant, the inland waterways having made their largest gains at the expense of the ocean carriers. This loss of the ocean carriers to the inland waterways, however, is only a proportional loss. As a matter of fact the increase of tonnage handled by the internal waterways represents to a large degree new business, much of it business that would never have existed but for the reduction of rates which the development of waterways secured. While the percentage of Belgian commerce handled by sea, both import and export, is now considerably smaller than it was fifteen years ago, the actual tonnage handled by sea is larger than formerly. Similarily, while the rail routes are now credited with a less total percentage of the total traffic than fifteen years ago, their actual tonnage is much larger.

In addition to the tabulation already given showing comparative rates by rail and waterways on coal over various routes, there is here included a statement comparing charges on other freight by rail and waterways, between Antwerp and the various places named.

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couraged. The policy of the Government is based on the theory that more benefit will accrue from cheap transportation than from large railway profits. The waterways produce an annual deficit in revenues, which the State makes up. But the Belgian theory is that in consideration of making up a small deficit the State derives benefits worth many times as much from the increased prosperity of the country.

On the whole, competition between railroads and waterways in Belgium is not so severe as in some other countries. While railway rates are fixed by the Government, canal freights are influenced by competition among owners of boats and barges. Railroad rates are much more stable than those of the waterways. Water rates are higher in winter than in summer, because the barges can only be operated during daylight on most of waterways, and there are several less hours of daylight in winter than in summer. Consequently journeys which can be made in a week or thereabouts, in summer, occupy eleven or twelve days in winter.

The volume of traffic offered to the water routes is also a large element in determining rates at a given time. Barge owners are always willing to give low rates when they can promptly secure loadings to their capacity. As there are hundreds of boat and barge owners, competition is keen. On the Antwerp exchange canal tolls are daily quoted. At times the amount of freight in Belgian ports becomes so great that the harbors are crowded, and it is necessary to hasten the unloading of vessels. If at such a time there happens to be an inadequate supply of barges the bidding of forwarding agents for the service forces up the water rates. Antwerp, the great port of Belgium, and Rotterdam, the first Dutch port, are in sharp competition for Rhine traffic, and this is one cause of low rates on this business. The case of a shipment of imported grain from Rotterdam up to Mannheim at 44 cents per ton was recently quoted. Rotterdam has a considerable advantage over Antwerp for Rhine freight, because of shorter distance and better connections, but Antwerp has superior facilities for transshipping and dispatching promptly.

TOLLS ARE INSIGNIFICANT

On all the rivers, no matter how much the Government may have spent improving them, and on many canals, no tolls are charged. In all cases the tolls are so low as to be almost nominal, and in a general way they are based on expense of maintenance. The Government, according to the latest reports available, receives in tolls between one-third and one-half the annual expenditure for maintenance of waterways. This does not include interest on the Government's investment, which is paid out of general revenues. In 1902 tolls were about $350,000, while the maintenance cost the State $930,000. Tolls are generally levied on the basis of some fixed charge per ton-mile, plus charges for the use of quays and docks, for passing bridges which have to be worked by draws, and other like charges. While there is considerable variation in these charges they are so low as to amount to an almost negligible proportion of the cost of transportation.

Various methods of haulage are employed. On the large rivers the common towage is by steam tugs which handle lines of barges, fre-

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ize them to meet the demand for larger barges, fewer locks, and faster transport. These methods are thus stated:

(a) In the case of navigable and canalized rivers: Regulating and deepening river beds with a view to obtaining uniformity; straightening and shortening the water courses by making new cuts, etc.; strenghtening the banks, refacing embankments, stone pitchings, and quay walls; construction of towing paths; improvements of dams and locks; built houses for the staff intrusted with the care and work of all the engineering appliances.

(b) In the case of canals: Enlarging, widening, or deepening different sections; rebuilding or improving the locks; strengthening banks, refacing, and renewing stone pitchings; construction of quay walls for commercial purposes; improvement of towing paths; building of houses for locks and bridge keepers; improving the water supply.

(c) In the case of harbors and coasts: Dredging with the view to improving the passes and channels at the entrance of harbors; construction of jetties, piers, stone embankments, etc., destined for the protection of the coasts; building an up-keep of the sea-walls, including stone pitchings, promenades, etc.; management and up-keep of the dunes forming part of the Royal Demesne, including leveling plantations, road making, etc.; the tolls on the navigable waterways which are under the administration of the State are fixed by the Government in the law of 1865. They are levied on a scale of so much per ton per kilometer, i. e., at so much on every ton of freight for every kilometer.

As a general rule the tidal rivers are exempt from tolls. On the other waterways the toll is fixed at 0.016 francs (about 0.3 cent) for the canalized rivers, i. e., rivers which have been rendered navigable by means of locks, etc., and at 0.005 francs (about 0.1 cent) for the canals.

As regards the waterways administered by companies, the tolls are fixed on different bases, according to the terms of the concession.

As an example of a tidal river, the Escaut Maritime (the Scheldt below Ghent) is exempt from tolls.

On the canalized Meuse to the toll is 0.0016 (about 0.03 cent) per ton per kilometer.

On the canal from the Meuse to the Scheldt the toll is fixed at 0.005 francs (about 0.1 cent) per ton per kilometer.

On the canal from Blaton to Ath (conceded to a company) the tolls are fixed at 0.024 francs (about 0.5 cent) on every ton of freight carried; 0.008 francs (about 0.15 cent) per ton on the total capacity of the vessel, and 0.008 francs per ton of the tonnage ton capacity of the vessel returning empty.

The State does not derive any interest from the capital expended on the improvement of the waterways, inasmuch as the work and use of this means of transport are left to private initiative. At the most the tolls levied on navigation may be said only to partly reimburse the State for the expense incurred in keeping the system of navigable waterways in working order.

THE GERMAN WATERWAYS SYSTEM

The modernization and extension of the German waterways system was initiated in the early days of the Bismarck régime following the unification of the Empire. It was Prince Bismarck's firm belief that nothing would so much contribute to make the Empire a stable and permanent structure as the improvement of transportation facilities and their control by the central Government. Therefore in the somewhat modest grant of powers first given to the imperial Government was included control over the postal service of the entire Empire, and a provision for facilitation of interstate communication by water, placing the interstate waterways under the imperial Government. In this regard the German constitution pretty closely followed that of the United States. It provided also that no State should be allowed to levy duties against another, but that the commerce of each State should be free and unrestricted in all the others. It was determined that on the natural waterways charges might be imposed for the maintenance of works designed to improve navigation, but that this should never exceed the expense of providing and maintaining such works. The canalized rivers are treated as artifi-

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At Bevern, half way between the two termini of the Dortmund-Ems Canal, starts the connecting waterway. It runs almost due east to Hanover, and thence to Berlin. It connects the navigable waters of the Rhine through the Dortmund-Ems Canal, the Weser, the Havel, the Spree, the Oder, the Warthe, and finally the Vistula. In part this great east-and-west water course is composed of streams upon which great amounts have been spent, and in part of canals linking the streams. Altogether this inland trunk line is to be about 600 miles long when completed. It intersects almost all the great navigable streams of Germany and is the center of the system of waterways. Physical conditions have made it impossible to secure uniformity throughout this great distance. Nevertheless, the aim has been constantly to approach this so nearly as possible. Not all the sections are yet complete.

Including rivers, canalized rivers and canals, in use or soon to be opened, the waterways mileage of the Empire is nearly 10,000 miles. Rather more than half is of free rivers; that is, streams which while improved in many respects have not required to be canalized. Of the remainder, canalized rivers and canals are about equal in mileage. The Elbe is navigable from its mouth as far as Prague, Austria, by vessels of 400 tons, and throughout a very large proportion of this distance by barges of 1,000 to 1,500 tons. The Rhine, on which barges of 1,500 tons and more go up as far as Mannheim, far in the interior, is connected through its great tributary, the Main, with the Danube by canal. Save only the Volga, the Danube is the greatest river of Europe. Connection between the Danube and the Rhine brings together the east and west of Europe, the north and south, the Black Sea, and the North Sea. Southwestern Russia, Roumania, Bulgaria, Servia, Hungary, Austria, Bavaria, and Wurtemburg are joined to the Rhine provinces, to the Netherlands, and to Belgium.

THE WATERWAYS PROGRAMME OF 1905

An idea of the character, cost, extent and method of financing the German waterways will be given by a summary of the waterways development project embodied in the Prussian legislation of 1905. This project, of course, is to cover some years in its execution; but before it is completed still more extensions will be ordered and more money appropriated to execute them.

The estimated cost of the 1905 programme was a little less than $85,000,000. It included the construction of the western section of the east-and-west water course which has been described, from the Rhine to the Weser, for which over $60,000,000 was set aside.

Stettin is the Baltic Sea port of Berlin, about 90 miles from the metropolis. There had long been fairly good connection by river and canal between Berlin and Stettin, but the demands for increasing traffic, and especially the need of accommodating larger barges, caused the inclusion, in the 1905 programme, of $10,000,000 to widen, deepen, and improve this route. Over $5,000,000 was devoted to improvement of the canals and canalized parts of the Warthe, between the Oder and the Vistula. Nearly $5,000,000 was set aside for canalizing an important section of the Oder so that it could carry heavier barges.

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The Berlin-Stettin canal's construction was made contingent upon a guarantee by local governmental divisions to make up any deficit in working expenses up to $150,000 a year and to pay 3 per cent interest on a proportion of the cost of the work.

The province of Posen was required, as a preliminary to carrying out the scheme of improving the Warthe River, to guarantee about $135,000 a year for operating and maintenance expenses, and 1 per cent a year for five years, 2 per cent a year for the next five, and 3 per cent a year thereafter, on about $1,500,000 of the investment.

The province of Silesia and local authorities within the province were required a guarantee operating deficit up to $52,000 a year, and to pay interest at 1 per cent a year for the first five years, 2 per cent the second five years, and 3 per cent a year thereafter on a capital debt of $225,000.

As to these various conditions imposed on the local or provincial authorities, some difficulty was experienced, but ultimately practically every condition laid down by the Landtag was met and the works are now well under construction.

In the early period of the development of the waterways system under State auspices less effort was made to secure the financial cooperation of local authorities within the State. The State was more willing than it is now to provide all the capital. But as the investment in waterways came to represent a considerable part of the State debt, regions which for topographical or other reasons were denied water transportation became vigorous in their protests. They pointed out that the whole State was taxed to provide transportation which immediately benefited only regions contiguous to the waterways. Accordingly, in later years, the policy of financial cooperation has been developed, thus far occasioning no check in the development of the system. While the State in the first instance finds the capital and directs the works, the local authorities underwrite a large proportion of the financial burden. It is probable that had not this arrangement been reached the protest against constructing waterways out of general taxation would ultimately have checked the development of the system. As matters stand now the commercial and governmental authorities of any region, when convinced that waterway improvements are needed, are heard by the minister of public works, and if their proposals seem meritorious and a reasonable financial guarantee is tendered, the State is likely to take up the project.

GROWTH OF THE WATERWAYS TRAFFIC

A great extension of technical knowledge and construction methods has in recent years contributed largely to increase the efficiency of this mode of transportation. As in other countries, it came to be realized three or four decades ago that to make waterways compete with railways they must be enlarged; so far as possible steam power must be made available; and that large numbers of small locks must

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be replaced by fewer and larger ones. When possible locks on important waterways are made so large that a steam tug with an entourage of barges may be accommodated at one lockage. The tonnage of barges has increased and the expense of transportation has been reduced. Taking the fleet on the German Rhine, for example, the official figures say that in 1887 there were 275 steamers, aggregating 17,000 tons. By 1897 the number of steamers had increased to 418 and their tonnage to 39,000; in 1904 there were 586 steamers and the tonnage showed a still further considerable increase. But the showing of the barge fleet in both numbers and tonnage is much more significant.

In 1887 there were 2,731 barges of 570,000 tons. In the next ten years, although there was an increase of only about 500 in the number of barges, the gross tonnage had more than doubled; in other words, the average tonnage per barge on the Rhine had just about doubled in this period. The increase is due to the improvement of the Rhine and its tributaries—particularly the Main and the Neckar. At present there are probably 12,000 boats and barges on the Rhine, including the German, Dutch, and Belgian fleets, and in capacity they go as high as 2,400 tons, drawing about 9 feet of water. Barges of over 2,000 tons ascend the Rhine as far as Mannheim and in favorable seasons even beyond. When the great east-and-west interior waterway from the Rhine to the Vistula is finally completed, which probably will not be for some years yet, it will accommodate barges of 600 tons throughout.

For many years German waterways were in the main free of navigation charges. It was, however, necessary, when the General Government began to divide the expenses with local authorities, to have a new policy of imposing tolls in order to meet the cost of maintenance and ultimately to amortize the public debts. The regulated rivers have generally been free, except where there were locks, for which dues were charged. For instance, between Berlin and Hamburg, on the route composed of the Elbe, Havel, and Spree, there are 3 locks, on which tolls are levied. These locks are on the Havel and Spree. The great expense of the Rhine-Weser Canal was considered to make necessary a more general system of tolls. The intention, however, is to inaugurate this only when the Rhine-Weser Canal is open for operation, and then to make the tolls so low that they will not be a serious charge on navigation.

The determination to enlarge and improve the waterway between Berlin and Stettin resulted from conditions of traffic. The minister of public works some six years ago pointed out in an official communication to the Landtag that the tonnage of the Berlin-Stettin Canal was falling off because it was impossible to operate on that route as large barges as could be accommodated by the Berlin-Hanover Canal. Thus, in the case of a shipment from Hanover to Stettin goods could be handled from Hanover to Berlin in 600-ton barges, but at Berlin must be transshipped to smaller barges for the remainder of the journey to Stettin. This added so greatly to the expense that the railways were preferred and it became necessary either to increase the railroad facilities from Berlin to Stettin, or else to increase the capacity of the waterway. The Landtag was appealed to on behalf of the selfish interest of Prussia to further this project because Stettin is a Prussian port, in competition with Hamburg, an independent State.

It was further pointed out that if the capacity of the waterway were increased so that it would accommodate 600-ton barges handled by steam tugs a much larger proportion of the traffic would go by water, and there would be a reduction in rates. Accordingly the improvement was authorized in 1905. It is expected the improved route will be ready for business about 1910 or 1911.

On the new Berlin-Stettin Canal considerable engineering difficulties are required to be met. These necessitate, among other things, construction of a new section of canal about 30 miles long northeastward from Berlin on an entirely new route in order to reduce the number of locks. At another point a difference of 120 feet in levels is required to be overcome in a very short distance, and to accomplish this the engineers have determined upon a flight of 5 locks of between 23 and 24 feet lift each. Between Berlin and Hohensaathen, about 60 miles, is practically all the difficult work on this new route. Hohensaathen is on the Oder, and from there north to Stettin the river is already navigable for 600-ton craft. This route will be assured an immense traffic. The Prussian authorities have calculated that classes of goods which now pay about 85 cents per ton from Berlin to Stettin will pay only about 25 cents. The confidence of the Government that so great a reduction can be effected is not generally reflected in the opinions of either railroad or bargemen, but all agree that the saving in freights will be very important.

BERLIN-HAMBURG WATER ROUTE

From Berlin to Hamburg is one of the most important water routes in Germany. The distance is about 235 miles, and there are only 3 locks, for which charges are made. In adjusting the lock dues the rule is to make a larger charge per lock on routes where there are few locks than on those routes where there are considerable numbers.

For the purpose of canal traffic on these important routes freight is divided into 4 classes according to value. The more valuable goods pay a higher lockage due, and the dues decrease as the value of the goods is reduced. A cargo of 500 tons of wheat coming from Hamburg up to Berlin in a 500-ton barge would pay about $40 in lockage dues.

In addition to the classification of freight there is also a classification of barges, depending on their construction. The more expensive ones are allowed to take expensive classes of freight. The cheaper ones are barred from accepting freight which might be more easily damaged. One class of craft in which a large tonnage is moved at some seasons of the year are built for a downstream trip only. These are light boats, put together very cheaply in Hungary, and sent down the Elbe with cargoes of fruit, particularly apples, for the German markets. The upper reaches of the Elbe are not always easy of navigation, and it is found cheaper to use cheap crafts for this business, and on arrival at their destination to knock them down and sell the material.

The one element of real competition which enters into transportation in Germany is introduced by the waterways. Obviously there is no railroad competition, because the States own nearly all the railroads. Likewise, as has been pointed out, the railroads are not permitted to compete against the waterways in a manner calculated to

drive the latter out of business. But among the enormous number of operators of barges and boats there is keen competition. It is doubtful, indeed, if there is much profit in operating barges, unless by a large concern, and in recent years the tendency in this line of enterprise, as indeed in almost everything in Germany, has been to consolidation and combination. Thus, on the Elbe the "United Elbe Shipping Company" was formed three or four years ago, bringing together 3 concerns that up to that time had been among the largest in that part of the Empire, and which had been in bitter competition. At times they had attempted to perfect "gentlemen's agreements," but these never lasted long and were absolutely ineffective. The consolidated company has a great fleet of towing steamers and barges, some of the latter of 1,200 tons capacity. The largest towing steamers will handle as high as 6,000 tons of freight in a single tow. In addition the company has its own warehouses, warehouse barges, and a fleet of lighters at Hamburg.

The warehouse barges represent an interesting method by which managers of barge lines overcome the difficulty in river navigation caused by the changes of water level. A huge terminal barge is anchored in the harbor and of course rises and falls with the level of the stream, as affected either by tides or the changing volume of water at different seasons. In other cases warehouses are constructed with elevators or cranes, so that whatever the level of the stream the freight may be taken directly from the barge and stored.

With the progressive enlargement of the waterways the tendency has been more and more to employ steam power. Horses and mules are used on the smaller canals and still, to some extent, on larger ones, but when boats of 300 to 1,200 tons can be used horses are unable to compete with steam. On the older routes, formed by the improvement of rivers, a common method of towing was to have a towing chain lying along the bed of the river which boats going upstream would pick up and with steam power wind around a drum, thus dragging the boat along. This was long supposed to be a very satisfactory method of towing for what were then regarded as the larger craft, but as improvements deepened channels and reduced currents this method became less desirable and the tendency has been to use paddle-wheel tugboats.

Although an inland city, Berlin has been made the center of a great water traffic. The tonnage has increased very fast since the Spree was made accessible to vessels of 600 tons. Routes radiate from Berlin to Stettin, Hamburg, Lubeck, Breslau, and to the upper Elbe by way of the Ihle Canal. This canal constitutes one of the important sections in the great east-and-west trunk waterway that has been described. It connects the Oder and the Elbe. Between Berlin and east Prussia there is much commerce by water, which will be immensely increased as soon as the improvements along the Warthe River are complete. Indeed, this route to Poland is expected to open a market for a greatly increased proportion of German goods.

Taking the route from Berlin to Hamburg by way of the Ihle Canal, the Havel, and the Elbe, a statement of the growth of tonnage illustrates the possibilities of river and canal navigation between great centers. In addition to the great fleet of barges and towing steamboats which ply on this river, there is what may be called an express freight service by cargo steamers, which run daily, leaving

and arriving at fixed hours, and hardly less regular in their movements than railway trains. Twenty-five years ago there were 2 of these steamers, carrying less than 100 tons each. It was regarded as a real achievement, when they were first put on, to make a trip each way once a week between Hamburg and Berlin. There are now something like 15 of these steamers. They carry as high as 300 tons each and maintain a daily service each way. Not only this, but going downstream each of them tows 4 or 5 large barges and going upstream they tow 1 and sometimes 2.

WATER AND RAIL RATES

It is not easy to make general statements about waterway freight rates because they vary so much with the condition of streams and the supply of freight. When the supply of freight is large and water low freights get much higher, while at times when the freight supply falls off and there is plenty of water in the streams rates almost reach the vanishing point. Speaking generally, however, it is stated that from Berlin to Hamburg, about 250 miles, rates vary from 50 to 75 cents per ton under ordinary conditions for more bulky and less valuable goods, and get as high as $2 for valuable and perishable freight. These figures are for traffic moving down stream. The rates upstream do not average much higher except by the express steamers, which have been described. These handle practically everything that a fast freight train in America would take, and to the apparent satisfaction of business men. All sorts of vegetables, wheat, and even oranges are handled by the express steamers. Competition for the orange business is very sharp and sometimes makes the rates extremely low. Goods of this class are taken by the express steamers from Hamburg to Berlin usually in two days, but in seasons when it is impossible for the steamers to run all night it takes longer.

Some marvels in cheap transportation have been made possible on this Berlin-Hamburg line. For instance, a great import business in grain comes through the port of Hamburg. At times barges have carried full loads of hundreds of tons of grain from Hamburg up the river to Berlin, and even beyond, absolutely without charge, for the privilege of being towed up the stream. They did this not because towing service was worth enough to justify hauling the cargo for nothing, but because at particular seasons of the year immense amounts of beet sugar and other products are moving from the upper Elbe to Hamburg for export, and there is not sufficient towage capacity to get the barges to the upper river as fast as they are wanted. Therefore, an empty barge might lie at Hamburg for many days earning nothing and losing its share of the paying business in sugar or lignite. Under these circumstances it is good business to haul a cargo upstream for nothing in order to get the barge where it can take on the sugar, which is waiting for transportation. Not only does the sugar pay good rates for this movement to Hamburg, but in going downstream there is practically no expense for power.

INTERFERENCE OF COLD AND DROUGHT

In Belgium and France ice interferes little with navigation of the *inland waters; in* France almost never. In Germany, on the other

hand, the climate is much more nearly like that of the northern United States, and almost every winter there is a period of several weeks in which water traffic is tied up. A gentleman who for more than twenty years had charge of a large shipping business on the German waterways, said that the longest suspension of traffic he had ever known was four months. That was in the very beginning of his experience, and under modern conditions would not be repeated, because nowadays the waterways are larger and great ice-breaking steamers are employed to open the way for the cargo boats. He said that three times in his experience traffic encountered no tie-ups throughout the entire winter; ordinarily the tie-up is from a month to seven weeks.

In 1904 the great drought throughout Germany, resulting in many even of the larger streams almost becoming dried up in their beds, became a real calamity. Because of the regular recurrence of the winter suspension of the water traffic, business interests accommodate themselves to the inevitable and so arrange their affairs that business is not injured. But when, as in 1904, the streams almost go dry and practically the whole commerce of the country becomes dependent upon the railroads, the results are very serious. Thus it came about, curiously enough, that following the experience of 1904, when the railroads were naturally unable to handle promptly the amount of business offered them, many people proceeded immediately to violent criticism of the railway management because it could not furnish cars and motive power enough to meet requirements. These serious drought conditions have seldom been experienced, and as the waterway system is further perfected the effect of drought is constantly less serious because in the first place better arrangements are made for conserving the water, and in the second place the big freight barges almost exactly fit the locks and a remarkably small amount of water will float through a lock a barge containing as much freight as a railroad train would carry.

One of the 600-ton barges, which now are common on the best waterways, measures 206 feet in length, 25 feet 6 inches in breadth, and draws 15¾ inches of water when empty and 6 feet when loaded to its capacity. Such a barge costs in Germany about $8,500. The express steamers are operated on the Elbe and Rhine, and to a less extent on other large rivers. They are handsome and well-built craft. One of these, built especially for speed, and which has never failed in good weather to make the trip from Berlin to Hamburg in forty-eight hours, is 167 feet long, 21 feet 7 inches broad, and when carrying 200 tons of freight and a supply of coal, draws only 4 feet 11 inches of water. It has twin-screw engines of 220 horsepower, and loaded to full capacity will go 10 knots an hour. With 2 barges in tow, so that the cargo plus that of the barges will aggregate 750 tons, it will make about 3 knots per hour. It requires a crew of only 6 men, costs about $22,000, and looks a good deal like a small seagoing steamer. This vessel represents, perhaps, the most perfect type yet developed for waterways in Germany.

THE TETLOW CUT-OFF CANAL

The development of canal trade centering at Berlin has in recent years become so enormous that a great congestion of freight and barges threatened the same result that has been experienced on big terminals of American railroads. At rush seasons there was so much business that it was almost impossible to move boats. Accordingly

the district council of Tetlow, a Government division to the south of Berlin, conceived the idea of constructing a cut-off canal around the city, so that barges might move around Berlin and avoid the danger of becoming entangled in the congestion there. A concession was granted to the Tetlow authorities to construct this cut-off route and they spent about $10,000,000 on it. This is at the rate of about $400,000 per mile. Under the terms of their concession the Tetlow authorities are permitted to charge tolls, which are already proving highly remunerative. In addition to this the Tetlow people conducted a handsome real-estate speculation, buying up land which became valuable for industrial purposes as soon as the canal was opened. As a result they are developing an important industrial district and the whole operation is assured success and large profits. Beyond this it has greatly improved conditions of navigation at and about Berlin.

In order that shipping may be protected against floods and ice a large number of harbors of refuge have been constructed, generally by a division of expense between the state and the local government bodies. Private interests have constructed quays and wharves in the cities and towns.

Perhaps the most important facility provided for accommodating and securing traffic for the waterways has been the system of so-called "light railways." As in Belgium and France, these light railways gather up traffic and bring it to the terminals along the canals. The problem of bringing freight to the canals is not so great as might be expected, simply because a large proportion of the industry of Germany has been built up since the waterways were developed. A manufacturer intending to establish a plant ordinarily considers with great care the question of whether he will desire most to employ rail or water transportation. If his business requires a great quantity of a particular kind of raw material, as coal, cotton or some other bulky article, he may be expected to seek a location convenient to a water trunk line, from which at the same time he will be able to secure a railroad switching connection. This is the ideal situation for a large establishment. Such a concern can use either kind of transportation, depending on conditions. Traffic which must be sent in great haste can employ express steamers or railroad cars; coal or other raw materials may be brought by barge. At seasons when freights by water are very low it is possible to lay in large quantities of fuel or raw material at a considerable saving in freights.

GETTING FREIGHT TO THE CANALS

This question of bringing freights to the waterways is necessarily one of great importance. The railroad is able at comparatively little expense to give a switching connection with any factory which promises a satisfactory tonnage. In England one method which traders allege was extensively practiced by the railroads in order to put the canals out of business was to deny facilities, switching connections, car supplies, etc., to industrial establishments which to any considerable extent attempt to divide their business with the canals. But when the same interest, namely, the Government, controls the two systems of transportation it becomes a comparatively easy matter to secure connections with both of them and to divide the tonnage in such manner as to produce the most economical result.

[illegible]

THE KAISER WILHELM CANAL

[illegible]

THE FRENCH WATERWAYS SYSTEM

[illegible]

of government administration is to develop the two systems of transportation, in the confident belief that on the whole the best interests of the country will be thus subserved. French managers of private railroad enterprises have devoted much effort at times to convince the public that it is bad economy to spend large amounts of public revenue on waterway development. Instead of attaining their purpose, the railroads have by this very campaign added strength to the sentiment in favor of direct Government operation of the railroads, and have done no small part toward developing the public sentiment which has made it possible to expend much public money in enlarging and improving waterways. In short, France is plainly determined that whatever may be shown by railroad statistics about the comparative cost of moving freight by rail and water, the best method of securing effective regulation of freight is by development of the waterways.

RAILWAY RATES ARE HIGHER

As a result of the success of some of the railways in securing control of private canals which were promptly deprived of a large proportion of their tonnage, and also because of efforts of the railroads to take business away from publicly owned canals by dint of extreme competition, the railroad administrative authorities some years ago fixed a general rule that railroads must charge a somewhat higher rate than waterways. From time to time this has been much modified in particular cases, but the rule still stands and the waterways are protected by it in their proportion of traffic. There is a feeling that while the railroads probably could in a comparatively few years, if permitted, take much of the traffic from the waterways, the result of such a proceeding would necessarily be to increase the cost of traffic by rail. In the first place, like nearly all the other railroads in the world, at present the French lines find more trouble in moving the traffic that is offered to them than in securing traffic to move. Consequently if a large proportion of the business now moved by water were thrown upon the railroads, the facilities of the latter would soon prove utterly inadequate, and a great capital expenditure would be necessary to enable them to do the business. So that, in the aggregate, the cheapest transportation is believed to be insured by the utilization of both rail and water.

The French waterways system is based on improving rivers and linking them by canals. The great rivers, which form the basis of this system, are the Loire, the Rhone, the Seine, the Dordogne, and the Garonne, their various navigable tributaries, and a number of smaller streams that have been extensively improved and made useful for navigation. The greatest waterway enterprise which France has undertaken is that connecting the Mediterranean with the Bay of Biscay across the southern part of the country. For years there has been a water connection through this region, consisting in part of the Garonne, which flows into the Bay of Biscay and is connected with the Gulf of Lyons by a canal.

Following a considerably different route, an enlarged canal is now under construction that will be of much greater commercial value and possibly of military significance by reason of allowing passage of naval craft. Despite great engineering difficulties, owing to variation in levels, the success of the scheme seems certain. As in the case

[illegible] the Rhine Canal in the north of Germany, the strategic consideration has not weighed, but it is expected that when the canal is finished its commercial importance and value will prove very great.

The remaining Meuse, Moselle, Saône and Rhône rivers play only less important parts than the streams already mentioned. None of the French lakes is of sufficient size to be commercially useful in the transportation scheme. The canalization of the rivers in the north of France is the Franco-Belgian international transportation scheme has been planned out.

FRENCH WATERWAYS REVIVAL

In the closing the latter part of the seventh decade of the nineteenth century the French began to be convinced that railroads should not be permitted to monopolize internal transportation. The dissatisfaction with national facilities and rates was so acute that even during the depression following the Franco-German war more than $[illegible] was spent in a very few years in improving waterways, including the [illegible] harbors. Part of this with a great work was accomplished in the improvement of navigation on the Seine, leading to Paris, and the great Eastern Canal, Canal de l'Est, was completed. The improvement of the canals in the north of France and the improvement of rivers in that section was also carried to a considerable extent during this period.

The results of these works as well as the knowledge that in the [illegible] of the seventies a programme was taken up for improving the waterways in a comprehensive fashion. It was proposed to secure the largest possible mileage of water routes connected throughout and direct, many large ranges of uniform size and construction. It was contemplated that these first-class water routes should be available for barges of [illegible] tons and should have a minimum depth of 4 feet [illegible] with locks of minimum length [illegible] feet and minimum width [illegible] feet.

In the [illegible] years nearly $[illegible] was spent on this project and the mileage of waterways of this type was increased from less than [illegible] miles. Most of this extension was in the improvement of rivers, but no less than [illegible] miles of new canals were built. The Eastern Canal was completed, and an important connection was established between the Seine and the Rhine in order to connect the Eastern [illegible] with those of the Rhine, which are important coal fields, with the eastern industrial region by a more direct route than had heretofore been available.

The port of Havre had been considering much of its business as a distributing agent because the water route on the Seine from Paris to Havre was [illegible] because of the rapidity of the Seine, where the waters were [illegible] to [illegible] make the operation difficult and dangerous. [illegible] of the necessity that these smaller [illegible] should navigate the [illegible] waters of a great estuary a canal was constructed from Havre to Tancarville, paralleling the lower reaches of the Seine through which the river boats might pass and avoid the lower river.

DIFFERENT METHODS OF IMPROVING RIVERS

The Rhone River, which has its source in the Swiss Alps and runs throughout the important part of its course nearly south in southwestern France, emptying into the Gulf of Lyons, has presented one of the most difficult problems which French waterway engineers have had to meet. It is the swiftest of the large French streams, and in many places there were rapids which made navigation impossible during most of the year, until after great improvement works had been carried out. On these works a great deal of money has been expended. The water has been confined into a narrow channel deepened by means of longitudinal dams; then, in order to conserve the supply and reduce the current, transverse dams have been employed where needed. The Rhone, as a result of these improvements, presents a fine type of what may be properly called the canalized river. Throughout the more important part of its length a depth of 4 to 6 feet is secured, practically throughout the entire year, and most of the time a great depth is available. Thus a stream that naturally was almost worthless for navigation has been converted into an important waterway.

The Seine yielded more readily to the purposes of the engineers, for its current was slower and volume larger. Craft drawing 9 to 10 feet of water now operate in great numbers from Paris down to Rouen, about 150 miles, throughout the year; while from Rouen to the mouth of the stream a still greater draft is possible.

On some of the French streams the engineers have employed in places a method of improvement whose efficacy was at first doubted, but which has been developed to remarkable success. It was not always practicable to build permanent works paralleling the channel for the purpose of confining the waters and increasing the depth, because in seasons of high water these were an obstacle to navigation, and moreover, it was impossible to make them so substantial that they would not be destroyed by the current. So, for reaches where a method of confining the water in a narrow channel during a season of low water was absolutely necessary, movable lateral dams or barrages were built, which confine the water and increase its depth in dry season, and can be removed so as not to obstruct the channel, or be destroyed in times of high water.

The locks on the northern streams and canals have been reduced to the smallest possible number consistent with maintaining a proper depth of water, and many have been built so large that it is possible for a towing steamer with a train of barges to be accommodated in a lock.

THE CANAL DE L'EST

The Eastern Canal follows along the eastern frontier of France, from Gibet on the Belgium frontier along the Meuse River, reaching its farthest eastern point at Golbey; thence it runs in a southwesterly direction along the Saone River to Chalon sur Saone, thence following the Saone south to Lyons. At Lyons the Saone empties into the Rhone, and from here to the Gulf of Lyons the Rhone, improved as already described, is used.

This so-called Canal de l'Est is really only in small part a canal. It includes the improved courses of the Meuse and Saone, connected

[illegible]

[illegible]

[illegible]

By far the most important water traffic in France is in the section from Paris northward. In this region again there is a similarity between France and Germany. The rivers of the south of France, for topographical reasons, do not adapt themselves so readily to navigation, and moreover there is no possibility of uniting them with the systems of other countries, to promote international traffic. On the other hand, the waterways of the north of France handle a maximum of import and export business from and to Belgium, Holland, and Germany, as well as to the world overseas through the ports along the English Channel.

CANAL TRAFFIC GROWS, AS DOES ALSO RAIL TRAFFIC

Since the definite inauguration of the large and systematic scheme of waterway improvements in 1878, the proportion of French traffic handled by the waterways as compared to the railroads has steadily grown. The railways have indeed enjoyed a very great increase in business, but the growth of tonnage on the waterways has been greater in proportion than on the railways. It is believed by some French authorities than when the great scheme of improvement on which the country is now at work has been completed, the tonnage of the canals and rivers may reach one-third of the total freight movement of the Republic.

The French policy in financing waterway improvements has developed along lines parallel to those which mark the latter-day German opinion on this subject. Originally, when the Government took up vigorously the proposal to better the waterways, it was the intention to make them all toll free. This prevailed for a long time. Likewise, the local governmental authorities were seldom called upon for important contributions to the expense.

But more recently, as the investments in waterways have become larger, and as the voice of protest has been raised from those regions which object to being taxed for waterways built in distant parts, the plan has been favored of dividing the cost between the Government and the cities or departments. In some cases, the plan for doing this has been very similar to that already described in connection with the German waterways, namely, of having the Government find capital and carry out the improvements, on condition that the local governmental division guarantee certain maintenance charges and interest.

The later policy in France is to exact tolls for use of waterways, particularly canals. This system of charges is not yet fully developed, and there is much protest against it. It is by no means certain whether ultimately the scheme of charging tolls will be kept in general effect. In any case, the tolls thus far imposed have generally been moderate, and proportionate to the number of locks or other works on the routes.

COMPETITIVE METHODS OF RAILWAYS

Reference having been made to the fact that in periods of unrestrained competition between railroads and waterways the railroads have been able to come out victorious, it is fair to explain that competitive methods were often employed by the railroads such as would not be permitted at all in the United States. For instance, the illustration may be used of a manufacturer located so that he can divide

[illegible]

[illegible]

[illegible]

would enable them to come up from the mouth of the Loire to the city. At first, improvement of the river was undertaken by process of dredging it to a great depth, and then a great canal for ocean-going vessels was undertaken to enable ships drawing up to 19 feet of water to go up to the city. As soon as this canal was opened there was a large increase in the tonnage and a great improvement in general industrial conditions at Nantes. The tonnage of the port greatly increased, and likewise the traffic of the railroads showed an immense improvement. In ten years the water tonnage handled at Nantes was multiplied by three and a half. The city's industry was saved from impending ruin, which would have caused inestimable losses to owners of all classes of property there.

The port of Marseilles, one of the most important, if not the most important, in France, some years ago felt the need of a direct inland water connection with the Rhone, whose mouth is about 40 miles west of the city. Accordingly a project was developed for the construction of such a waterway, so that barges from the Rhone might pass directly to Marseilles without either entering the Gulf of Lyons or transshipping overland. An arrangement was made by which the expense of this improvement should be borne jointly by the national government and the city. This illustrates the tendency to adopt the German system of dividing expense between the State and the interested localities. In both Germany and France the impression is that this method is likely to result in a more rapid extension of the waterways system. The political objections, which were naturally urged against large expenditures by the State for the benefit of limited localities, lose much of their force when the expense is divided in this fashion.

There is also, in recent years, a tendency in France to provide, partly by imposition of tolls and partly by exacting financial guaranties from interested localities, for the ultimate repayment of the money invested in making these improvements.

In the consideration of any great scheme of improving the water highways of the United States, especially the rivers, it would seem that careful study ought to be made of this plan of requiring the localities to show their interest in the enterprise by substantial financial contributions. At least, it would seem that there is merit in enforcing a requirement that cities provide terminal and harbor facilities if the government bears the burden of improving the waterway.

THE INLAND WATERWAYS OF AUSTRIA-HUNGARY.

During the last half of the last century there was expended on the river improvement and development of Austria, exclusive of Hungary, rather more than $100,000,000. Even this was regarded as practically only marking the beginning of the real modernization of these works. Accordingly in 1901 a scheme of expansion was inaugurated and provision was made by legislation for the expenditure of about $50,000,000 on further river improvement and canals. Of this amount, one-third was to be devoted to the rivers—widening, deepening, and regulating their currents—and two-thirds to building canals of modern size. After the money was provided there was a long delay, owing to the desire of the Government's engineers care-

fully to study the situation and to experiment with the flow of water courses, etc., in order to acquire a large fund of basic information to guide their work. Only recently has the work of actual construction contemplated under this appropriation been seriously inaugurated.

This project is regarded as in no way conclusive; the Government designs when this expenditure has been made to place another great sum at the disposal of the department of public works for more work of the same kind.

The Hungarian Parliament has been hardly less generous in its provision for waterway improvements. After spending about $40,000,000, chiefly on rivers, very little having thus far been devoted to canals, Hungary also is making provision for further development of its system in harmony with the plans of the Austrian division of the dual monarchy. In both these countries the railroads are mainly State owned, and just as in Holland, Germany, France, Belgium, and other countries, it is now the settled and unquestioned policy of the Government to devote something like equal attention to the two parallel systems of transport.

THE DANUBE AND THE MISSISSIPPI COMPARED

A great portion of the navigable length of the Danube River is in the Austro-Hungarian Empire. This is not only one of the world's greatest rivers by reason of its length and volume, but there are few which can compare with it for commercial significance. Latter-day Austrian policy has looked largely to the east and southeast of Europe for development of Austrian commerce, and to the great Danube, which is to southeastern Europe what the Mississippi is to the central valley of North America or the Yangtze to the great plains of southern China. If development of the Danube and its great navigable tributaries produces the results for which the Austria-Hungary Government hopes, this waterway system will one day carry the commerce of industrial Austria not only to the south-of-Europe States of Bulgaria, Roumania, Servia, Turkey, and Greece, but will become the highway of a world trade that will reach to Russia, Asia Minor, and the whole East. Nowhere has the picture of future commercial development been painted in brighter colors than by those Austrian statesmen who believe their great river is not only to be the means of permanently and securely cementing together the elements of the Empire, but is to make the firmly united Austria of the future a workshop, from whence shall go forth a great volume of manufactured goods to all the near East.

The Danube is 1,800 miles long and is navigable from its mouth in the Black Sea well into the interior of Germany. Beyond this it is connected with the Rhine by a small canal, which is to be enlarged to the utmost capacity that water supply and other physical conditions will permit.

A study of the maps of Europe and North America suggests a striking parallel between the relation of the Danube to southern Europe and that of the Mississippi to North America. The Danube has its great navigable tributaries, as the Mississippi has. Each drains an Empire of splendid fertility and resource. The Black Sea, into which the Danube empties, in this comparison corresponds to the

Gulf of Mexico. On the shores of the Black Sea and accessible to the commerce of the Danube are the ports of a half-dozen countries, gateways to unlimited markets. Likewise, the Mississippi and the Gulf constitute the highway and the open door to the trade of Mexico, Central and South America, and the West Indies.

Austria's navigable waters aggregate something like 4,000 miles in length, and include, in addition to the Danubian system, a section of the Elbe in Bohemia, about 200 miles long, one part of which has not yet been made navigable for steamboats, but which is included in the scheme of improvement. The Moldau, a Bohemian tributary to the Elbe, has also been extensively improved in connection with the work on the Elbe.

WORKS AT THE "IRON GATES"

The most serious obstacle to navigation of the Danube is at Orsova, in the extreme southeastern part of Hungary, just before the stream enters Roumania. The stream here passes through a course of rapids and cataracts, the "Iron Gates" presenting the most serious menace to navigation. The stream passes through a remarkable formation of rocks, and the channel is very swift and dangerous. Immense amounts of money have been spent for the control and improvement of the river in this section, the works that have been built being among the most remarkable of the kind ever undertaken. Tolls are exacted for the use of the new channel at the iron gates, this being the only place in Austria-Hungary where tolls are levied for the navigation of a river.

The improvement made by the Hungarian Government at this point cost nearly $10,000,000. As the navigation of the Danube was guaranteed free to various nations under treaty arrangements it was necessary, before tolls could be charged, to have a treaty stipulation to that effect. Accordingly, in the treaty of Berlin, provision is made for such tolls, designed to pay for the maintenance of the works, and ultimately to amortize the State's investment in them. These tolls as yet amount to much less than the annual interest on the loan plus the cost of maintaining the works. The deficit is made up by the Government of Hungary.

In general the Austro-Hungarian policy in river improvements has been to divide the cost between the general government and the cities or districts immediately concerned. Various divisions have been agreed upon in different cases. It will, of course, be understood that the Hungarian Parliament has entire control of these matters in Hungary and the Vienna Legislature in Austria proper.

In addition to something like $40,000,000 which the Hungarian Government expended in river improvement during the last half of the last century, nearly $70,000,000 has been invested by various river improvement organizations in Hungary. The investment of $10,000,000 at the "Iron Gates" is also in addition to the $40,000,000 already mentioned; so that the total of these investments in Hungary will pass the $100,000,000 mark, and brings up a round total for the dual monarchy of over $200,000,000. This, in turn, while representing a period between forty and fifty years, by no means covers the entire expenditure from which navigation derives benefits; for no inconsiderable amount of work was done prior to the middle of the last century.

DEVELOPMENT OF TRAFFIC

As a result of the modernization of works the increase of waterway tonnage that was to be expected has been taking place. In twenty years the water tonnage of Hungary has approximately doubled, and in Austria the increase has been in even larger proportion. Thus in the five years ending with 1890 the Danube Steamship Navigation Company, the most important on the Austrian section of the river, handled 1,263,000 tons of traffic, while in the single year 1900, after improvements had been made, it handled 1,503,000 tons; in other words, the tonnage for a single year was much larger than for five years at the earlier period. Since 1900 it has been steadily increasing, and is now probably 2,000,000 tons annually. These figures are fairly illustrative of the development of this traffic in Austria.

The golden age of water commerce in Austria-Hungary, however, is still in the future. Splendid projects of commercial development, based on the idea of extending Austrian trade into all the Near East, with the Danube as its chief artery, are in contemplation; and as waterways are further improved the growth of business constantly justifies the expenditure.

THE WATERWAYS OF HOLLAND

Of all European countries Holland alone presents a situation in which the railroads have required to be protected against the competition of canals in order that they might continue in business. Holland thus reverses the rule which applies to other countries.

There are two or three reasons for the great advantage the waterways have always enjoyed in Holland. In the first place, railroad development was remarkably slow in Holland, because for many years after other countries had engaged extensively in railroad construction Holland was not impressed with the necessity for adopting the new method of transport. The Dutch waterway system was extensive, reached to a very large part of the flat country's area, and was cheap. Thus railroads, during the earlier period when railroads were short local lines, found competition severe and were far from profitable. This experience discouraged capital from ambitious essays in railroading.

But Holland at last found that it could not rely on waterways alone because international commercial relations were too important, and its waterways could not keep it in commercial touch with Germany, Belgium, France, and the rest of Europe. Other countries had devoted their energies to railroads, and the great international waterway scheme which is now so important in western and northwestern Europe was only rudimentary. In order to get into touch with its neighbors Holland was forced to undertake railroad building, and as private capital was too wary the Government constructed the new roads.

RAILROADS RENEWED PROSPERITY

The commercial development and expansion following the State's enterprise in railroad building have justified the policy. Before the new railroads were opened some sections of Holland which had once been industrially important had become almost dormant by

reason of their isolation. The Dutch Government built railroads not with the expectation that they would be profitable as investments, but because they were seen to be absolutely necessary to save the country from industrial decadence. They have served this purpose, but they have never been profitable. The policy was to construct the roadways with money raised by the pledge of the State's credit, and to lease these to private companies for operation. The private concerns in the main provided equipment, but did not guarantee the fixed charges on the Government's investment. If they had been required to do this, they would soon have become bankrupt, for the development of international traffic was slow and the railroads found themselves unable to take from the canals any great proportion of the tonnage. Holland was thus the only country in which the State provided both rail and water highways substantially free of capital charge.

In the main the waterways were toll free. The only charge for their use was that of the boats and barges. The railroads' situation was quite similar, because the Government was compelled for many years to pay most of the interest on their capital debts. For a long time, and until very recent years, the private companies' payments to the Government never exceeded 1 per cent on the capital debt. The important consideration from the Dutch point of view is not the measure of profit the State has been able to extract from this investment in railroads, but the revival of Dutch commerce and industry. In France and Germany waterway systems were developed at State expense to supplement the railroads; in Holland railroads were constructed by the State, and owned at a loss, to supplement the waterways. In each case the policy has been so well vindicated by results that it seems fair to say that no country's waterway system can be so good as to justify neglect of railways, and no railway system can be so perfect as to justify letting the waterways fall into disuse.

It is not the purpose here to present a detailed discussion of the Dutch waterways, because it would add little to the impression that may be gained from what has been said about those of Belgium. In Holland, as in Belgium, the rivers have been the basis. Canals have been built to connect the rivers one with another, to connect them with seaports, and to bring the sea up to the important cities.

TROUBLES OF DUTCH RAILWAYS

Transportation by canal having been nearly universal in Holland, and a canal system having been developed before anything like a railroad network was built, the railroads found themselves, when at last they were ready seriously to compete for traffic, at a great disadvantage regarding local business. Even with the advantage of having no capital charge, railroads were unable to meet the water rates, and for years passenger traffic was the larger reliance of the rail routes for revenues. Then by reason of connection of the Dutch with the German railways the through business began to be important and productive. Encouraged by this increase in long-distance business, the railroads next entered seriously the field of competition for local freight, and in recent times have secured a fair showing. To do

this they have been compelled to make very low rates. The advantage is still with the water routes and probably will remain there.

But in other ways Holland's experience repeats that of other countries where rail and water highways have been constructed side by side. The gain of the railways in freight tonnage has not been the loss of the waterways any more than the gain of the waterways in other countries has been the loss of the railways. Here again the rule has been demonstrated that commerce grows as better and cheaper transportation is provided to encourage it. The waterways probably have profited more extensively even than the railways by the immense increase of business in the last quarter century. With the development of the upper reaches of the Rhine and other German waterways, Dutch water traffic has grown fast and has come to compete vigorously with the long-distance international freight movement, which at one time it was supposed could be handled only by the railroads. Deeper and better waterways have brought larger barges, and hardly less important than this, improvements in motive power. The general introduction of steam towage and gasoline motor barges has kept the balance well preserved between the two systems while retaining the advantage on the side of the water routes.

It is impossible in the time and space at command to give a detailed statement of the expenditures on the Dutch waterway system. An estimate of $125,000,000 for the last forty years is probably on the side of moderation. This figure makes no pretense of covering expenditures of landowners in obtaining small navigable ditches through their own lands, or of many local governmental divisions. It does include the expenditures on about 1,000 miles of rivers and canals, including the Amsterdam ship canal, the work for prevention of floods at the junction of the Maas and Waal rivers, the Merwede Canal and other large works, which have absorbed large sums.

RAIL AND WATER RATES

A recent comparison of rates by rail and water on freight moving over what in Holland are long routes, gives the following figures:

Rates by water and rail

	Distance.	Rate.
WATER.	*Miles.*	*Per ton.*
Ore, Rotterdam to Ruhrort	156	$0.30
Coal:		
Ruhrort to Amsterdam	156	.36
Ruhrort to Rotterdam	156	.36
Amsterdam to Arnheim	75	.36
Amsterdam to Utrecht	25	.24
Grain:		
Rotterdam to Ruhrort	156	.36
Amsterdam to Wormerveer	19	.24
Amsterdam to Groningen	107	.50
RAIL.		
Coal, Essen to Amsterdam	126	1.10
Ore, Amsterdam to Essen	126	1.20

THE BRITISH WATERWAYS—A CONTRAST

Great Britain is chiefly of interest in a study of waterways because of the sharp contrast it presents to conditions on the Continent. British waterways have been neglected or have fallen into subordination to the railways.

Some reasons for inferiority of British waterways have already been suggested. English industrial cities are located, to a great extent, on or near the ocean, and neither railroads nor waterways can compete with ocean traffic. The British railways do indeed attempt this competition, even carrying great amounts of coal from northern England to London. But there is a strong and probably increasing impression among the traders that the railroads make no profit out of this traffic, and that perhaps if they had attempted to handle less of it their financial condition to-day would have been better than the record of decreasing net earnings shows it to be. In order to handle this traffic it has been necessary for the railroads to build more tracks and supply themselves with more and more cars. Even when these facilities are provided, they must still handle the business, except to noncompetitive points, at rates which will meet those of the ocean carriers.

Before the era of railroads, canals in Great Britain were highly profitable, and there was an era of animated speculation in their shares. The Duke of Bridgewater's Canal, from Worsley's to Manchester and Liverpool, was the first important artificial waterway opened in England, having accepted its first traffic in 1759. It was successful from the very beginning, and initiated the era of canal speculation, which was not confined by any means to the United Kingdom, but which spread to the Continent, and for a long time was quite as animated as railroad speculations became in America about a century later. Some canal companies sustained heavy losses, others made magnificent profits. The Duke of Bridgewater's Canal is credited with laying the foundations of the industrial greatness of Manchester, which in later years, with the revolution of transportation methods, was compelled, at immense expense, to construct a canal connecting with the Mersey, so that great seagoing ships could come up to the city.

EARLY BRITISH CANAL ERA

What the Duke of Bridgewater's Canal did for Manchester the Aire and Calder Canal did for Leeds. Birmingham likewise secured connection by canal with Liverpool and the sea and reaped similar benefits.

In this earlier canal era of Britain, not only were all kinds of freight handled by water, but the passenger traffic on many routes became highly profitable. As soon as the railroads came in, the passenger traffic was immediately lost to canals, and presently the freight tonnage began to go the same way. The popular craze for railroad investment made it impossible to get money to improve the waterways. Further than this, stockholders in canal companies, which had been highly profitable before the advent of the railroads, showed exceedingly poor business judgment. They refused to reduce their rates to meet the competition of the railroads, apparently preferring

to do no business and earn no dividends rather than to lower charges to produce more modest returns. Finally the railroads by various devices secured control of a large proportion of the canal mileage, and have pretty systematically taken the business away from the canals.

In the extensive investigation which the British Royal Commission on Canals and Waterways has recently conducted, it has been repeatedly developed that one reason why the British waterways system is a failure is to be found in the fact that it is not a system at all. Whereas in Germany, France, and other countries effort has been constantly made and great expenditures has been incurred in order to secure the greatest possible approximation to uniformity, to accommodate the largest craft, and to extend the system in the most advantageous fashion, in Great Britain there has been practically no such effort.

INFERIORITY OF ENGLISH CANALS

Thus it was brought out before the commission that between London and Liverpool, a route which might be expected to present magnificent opportunities for business if a good water course were provided, there were 4 different gauges in the canal, the section of smallest gauge accommodating boats no larger than 30 tons, while the largest craft that could be taken were only 80 tons. Comparing these with the 300, 500, 1,000 and even 2,000 ton barges, of which long strings are handled by towing steamers on continental waterways, the reason for the inability of English canals to compete with the railroads is made quite apparent. The British traders all assured the commission that in their opinion nothing like system could ever be produced until some method of governmental control were used, and until the canals were taken from the railroads and made distinctly a public utility.

In this connection it must not be understood that the entire mileage of British canals has fallen into railway ownership. On the other hand the figures show that internal navigations in the United Kingdom aggregate 3,901 miles, of which only 1,138 miles are owned by the railways. But the "mileage not owned by the railways, includes of course much of the mileage of the navigable rivers." Taking out this mileage of rivers and basing the comparison on canals only, the railways appear decidedly to control the situation.

POWERS OF THE BOARD OF TRADE

The British railway legislation applies equally to railways and canals and gives the board of trade certain powers over the construction, physical operation, rates and traffic arrangements of both. The railway and canal traffic act of 1888 established the present railway and canal commission. Its powers apply to railways and canals alike. It provided that revised schedules of maximum tolls, rates and charges, must be submitted to the board of trade. It was under this provision that the board of trade prepared the maximum schedule of freight rates enacted afterwards by Parliament and known as the provisional orders acts. Under this authority the board provided maximum rates not only for the railroads of Great Britain but for 149 canals.

The board of trade is empowered to require reports from canal companies, showing the capacity of the canal for traffic, the capital, revenue, expenditure, etc., and to make inspections of canals alleged to be in bad condition.

An important provision prohibits under heavy penalties the use of a railway company's funds for the purchase of a canal or an interest therein without express statutory authority. The board of trade is empowered to authorize the abandonment of derelict or useless canals, and to release the owners from liability to maintain the same; and the board is also authorized to give its permission to the transfer of a canal to some body established to manage it, or to some local authority. But such authorization must be confirmed by Parliament. There is only one case in which the board has authorized the abandonment of a derelict canal. This was the Thames and Severn, which having lost its traffic was taken over by a corporation in which various neighboring navigations were interested, as well as local governmental authorities. This trust soon found itself unable to carry the burden, and application was made to the board of trade to abandon it, which was granted and afterwards confirmed by Parliament.

CONTROL OF CANALS BY RAILWAYS

It was repeatedly brought out in the testimony taken by the royal commission that agreements have been made between railroads and independent canal companies, by which the canals bound themselves not to charge less than a fixed percentage of the rail rates. The testimony also indicated that the canals were practically compelled to agree to these terms in many cases because if they refused the railroads would force upon them a competition that finally would take away all their traffic. But it was the testimony of many canal managers that when they could make reasonable terms with the railroads they were able to handle a large traffic at a profit. There was much testimony as to the large quantity of coal handled by canals in different parts of England, and it was shown that some of them have succeeded in keeping, despite the competition of the railroads, a heavy volume of this business. As to coal and other bulky traffic it was repeatedly explained that the greatest difficulty the canals experience is in securing a load for the trip back toward the collieries. When there is reasonable guaranty of back loading, coal canals have generally been able to take care of themselves.

It was frequently charged by business men before the commission that the railway companies seemed, as soon as they came into control of a canal, to prefer to operate the canal at a loss in order that they might divert the traffic to the railway. Thus in the case of the North Staffordshire Railway, which controlled a canal of some importance, it was pointed out that the railroad company's report to the board of trade indicated that the railway was losing $150,000 a year by reason of its control of the canal. This was one of sundry instances in which a railroad had taken control of a canal under guarantee to pay a fixed interest on the canal company's capital. It appeared in this and like instances that the railroad year by year made up from its own revenue a deficit of the canal, and yet never seemed to attempt to improve conditions on the canal so that it could earn its own way, apparently preferring to do the business by rail and pay the deficit.

Mr. H. W. Empson, representing the York Chamber of Commerce, said in this connection:

My experience is that at the present time a determined effort is being made by our railroad companies to strangle the water traffic with a view to getting the transit arrangements in their own hands, and so by destroying competition to enable them to charge higher rates and thus handicap our manufacturers in their endeavor to compete with foreign rivals. This has been especially noticeable since the railroads acquired steamers for the continental traffic. I have had several consignments from the Continent ordered to be transshipped into steamers at Hull which have fallen into the hands of railroad companies. In fact traffic intended to come by water is being constantly diverted to the railway at Hull and Goole. I might further venture to give another illustration. I remember many years ago we had a steamer daily carrying goods between Hull and York at rates considerably below the railway. Owing to difficulties at certain times in the navigation, this was discontinued, when immediately the railway rates were increased 25 to 30 per cent.

RAIL RATES HIGHER THAN WATER RATES

Mr. Empson, in answer to an inquiry as to whether he could give any comparison of competitive rates between water and rail showing that the water rate effected a saving over rail rates, prepared a schedule giving competitive rates under which the waterway effects a saving in some cases of 50 per cent, as against railroad rates, between York and London, Selby and Hull, York and Hull. The schedule follows:

Effect of water competition on railway rates between York and London, Selby and Hull, and York and Hull

[Extract from Mr. Empson's proof of evidence: "By the annexed schedule of competitive rates you will see that the waterway effects a saving in some cases of 50 per cent over railway rates, as between York and London, Selby and Hull, York and Hull."]

RATES SCHEDULE

	Water.	Railway.
Fertilizers:		
Hull to York	2s. 9d. to 3s. per ton	4 tons, 5s. 10d.; 7 tons, 5s.
Newcastle or Tynemouth to York	6s. 9d. to 8s. per ton	7s. 11d. per ton in 5-ton loads or over.
Leeds to York	3s. 9d. to 4s. per ton	5s. per ton in 5-ton lots.
London to York	7s. 2d. to 7s. 5d.; 6d. extra under 50 tons.	15s. per ton in 4-ton lots or over.
Grain, Selby to Hull	1s. 10d. per ton	3s. 9d. per ton.
Cocoa, London to York	18s. 4d. per ton	27s. 6d. per ton.
Sugar, London to York	18s. 4d. per ton; if free on wharf, 15s. 10d.	24s. 1d. per ton.
Treacle, London to York	15s. 10d. free on wharf	20s. per ton.
Rice, London to York	18s. 4d. per ton	24s. 2d. per ton.
Grain, Hull to York	1s. to 2s. per ton by barge loads (average cost 1s. 9d. per ton).	5s. 10d. per ton in 4-ton lots; 5s. per ton in 10-ton lots.
Timber, Hull to York	3s. 6d. per ton	5s. 10d. per ton.
Sugar:		
Hull to York	8s. per ton; 5s. 6d. per ton in 50-ton lots.	9s. 2d. per ton; 7s. 6d. per ton in 50-ton lots.
York to Scarborough (same distance as Hull to York).	13s. 9d. per ton	

It was the conviction of many witnesses that on the conservancy boards which manage the navigation and improvements of many British rivers and harbors, the railways are very frequently altogether too strongly represented. It was charged that even on such important rivers as the Clyde, Tyne, and Tees, the railroad interests had become so influential that almost no progress had been made for

many years. This criticism related to a period when these rivers were under a species of municipal control, and it seems to be decidedly the opinion that the railroads or related interests in municipal politics had prevented improvements. Later these particular streams were placed under the conservancies and conditions improved. The testimony seemed to indicate the opinion among traders, however, that the railroads were liable to make themselves influential to the detriment of waterway interests, no matter what kind of administration was in charge of the waterways, if they could thereby improve the traffic of the roads.

WATERWAYS MUST BE EMANCIPATED AND PROTECTED

Mr. Lanclot Foster, an alderman of the city of York and at one time lord mayor, told the commission that it was necessary to free the waterways from railway control and to prevent the railways from carrying goods at especially low rates to points served by water with the express purpose of killing navigation and then diverting the traffic to the rails. He said:

> The railway companies with their extensive ramification of lines and heavy traffic carried can quote a low rate for places served by navigation without any serious loss, owing to the opportunities of recouping themselves in the case of rates to places not so served. Such a course means the ruin of the navigation. When the low rate has served its turn the railway companies then raise their rates to paying figures.

Mr. Foster cited the case of the Northeastern Railways' control of the navigation of the Derwent River. The navigation was purchased by the company in 1865 at a cost of £40,000. Thereafter the tolls and dues were enormously increased. Mr. Foster said:

> In evidence given at a board of trade inquiry in 1893, the president of the Malton Traders' Association, stated that when the Northeastern Company got control of the navigation, the tolls on coal from Derwent Mouth to Malton (a distance of 40 miles) were raised from 4d. to 10d. per ton, then again to 1s. 6d. and eventually to 2s. 6d. per ton. Not satisfied with this it was proposed to further increase the rate from 2s. 8d. to about 3s. 8d., and I may say that the dues on coal in the Ouse River for a longer distance are 2d. per ton. There is a canal in connection with the Derwent—that is, the Pocklington Canal—which is now absolutely derelict; that is, as far as Canal Head; according to the railway company's schedule of tolls published in 1863, one of which I have in my possession, and of which I do not know whether there is another extant, because I know when anybody had one the railway company borrowed it, and never returned it, and I believe the one I have is practically the only one extant, that shows in 1863 the rates for coal cinders and slack were 3s. per ton to Canal Head, a distance of 22 miles. We sent coke from York to Hull regularly and the tolls are only 2d. per ton for the whole distance of 60 miles. That shows the difference between waterway and railway management. In the face of these proposals and the further increase of dues, a Derwent navigation committee of riparian owners and agriculturists, Lord Londesborough and several other important land owners protested, and so strong was the opposition that the objectionable clauses were ultimately withdrawn. As an agriculturist trader on the river over a long period, perhaps for 30 years, I can speak from personal experience of how the trade has been handicapped by the exceptionally high tolls charged on the River Derwent. Old residents in the district can remember the time when over 40 vessels traded to Malton with coal and other goods, bringing back timber, etc. Now the traffic is practically extinct.

SAMPLE RESULTS OF RAILWAY CONTROL

Mr. Foster also outlined the history of the Ripon and Boroughbridge Canal, on the River Ure, which is also a tributary of the Ouse. This canal is owned by the Northeastern Railway, having been bought in 1847 at a cost of £34,577. In 1869 twenty vessels were engaged

in coal trade on the canal. In 1894 the company sought parliamentary authority to sell their interest in the canal, but a deputation of business interests and neighboring navigations protested so strongly that the company withdrew the request for such permission, and subsequently offered to give the canal to the city of York provided the city would underwrite the obligation attaching to it. This was declined owing to the state of the canal and the entire absence of traffic. Mr. Foster said the canal is now absolutely derelict and it is impossible for boats to travel upon it. The traffic has been diverted to the Northeastern Railway. The canal's length is only about 9 miles, and the railway's charge for hauling coal is 9½d. per ton. Prior to the passing of the railway and canals act, the coal was 1s. 11½d. per ton, while on the Aire and Calder Canal, an independent waterway, the charge is 10d. per ton for 23 or 24 miles with locks; and on the Linton Lock Navigation of 8½ miles it is only 4½d. per ton, the Linton being another canal independent of railway control; and finally, Mr. Foster said that on the Ouse the charge for the entire length, which is much greater, is only 2d. per ton.

These cases are only typical of a great number which were elucidated in the testimony before the Commission.

The industrial witnesses insisted that one reason why the canal traffic had fallen off was that the railroads were not compelled to make joint rates and establish through routes in connection with canals. Reference was constantly made to the contrast which continental conditions presented in this regard. Mr. Empson cited a case in German experience with which he was familiar. He said:

> A manufacturer at Freiberg, a town about 20 miles from Frankfort, told me he got his coal from Ruhrort on the Rhine by water to Frankfort, whence it was transshipped to the railway, thus saving some 6d. per ton over the through railway rates. I think it very important that some arrangements be made for compelling railway companies to give facilities for the interchange of traffic with inland waterways. You have already had evidence from several witnesses in Belgium and Germany that this interchange is effected to the advantage of manufacturers and the reduction of rates.

WATER ROUTES HELP RAILWAYS

Mr. Empson in the course of his testimony, emphasized the fact that in Germany's experience a great increase of railway traffic had invariably followed the improvement in water facilities. His conclusion from all the evidence he had been able to adduce was that far from injuring the business of the railroads, improvement and extension of waterways had invariably proved beneficial to the railroad because it had been the means of originating a vast volume of new traffic. In this connection he quoted a well-known engineer of Frankfort, Mr. Lindley, thus:

> Mr. Lindley states that the traffic on the river Main before the improvement works were carried out was 10,000 tons per annum, and the traffic in 1887, the first year after the improvements were carried out, was 495,000 tons, and in 1905 it had risen to 2,550,000 tons, and the reduction in freight on coal from the Ruhr district was 2s. per ton, and for other goods from the Rhine district 5s. per ton. The dues levied vary from 1½d. to 3d. per ton. The largest boats have a loading capacity of 1,500 tons drawing 8 feet of water. I might further add that as a result of this improvement there has been a very great increase in the railway traffic. It is frequently said that the improved facilities for water communications have an injurious effect on the traffic of the railways, but this is an illustration to the contrary, and you will be aware of probably one or two others. There is a similar case where the result of river improvement has been to increase the railway traffic, the one recorded in connection with the improvement of the river going up to the town of Nantes.

Mr. Empson cited the rates on timber from Hull to Selby, where there is water competition with the railroads. Here the rate is 2s. 10d. per ton, a distance of 30 miles, compared with which he quoted 7s. 6d. as the rate on timber from Howden to Selby, a distance of 10 miles, but over a route by which there is no water competition. He ascribed the difference entirely to the fact that one route had water competition and the other had not. He pointed out further that sugar is handled by rail from Hull to York at 9s. 2d. per ton, and from Harrogate and Malton to York at exactly the same rate. Yet the distance from Hull to York is twice the distance from Harrogate and Malton. The lower proportional rate from Hull he ascribed entirely to the fact that there is a water route from Hull, whereas there is none from Harrogate and Malton.

YORK'S EXPERIENCE AS AN ILLUSTRATION

Mr. J. D. Morrell, director of a large industrial enterprise at York, presented the following statement:

In considering the question of the value of the Ouse navigation to us, I would like to point out the gain we had in the competition between the railway and the water carriers. In a place like York, where the railway company had a monopoly, without the river we should be absolutely at their mercy.

To illustrate this I give a comparison of railroad rates between York and towns to which there is effective water competition, and towns to which there is no effective water competition. The comparison is between the ratio that the rates to those towns bear to the maximum charges that the railway company might charge. I give examples of rates to nine towns, divided into three groups:

1. Railway rates from York to ports to which there is effective water competition—Goole, Hull, London.
2. Railway rates from York to ports to which there is not effective water competition—Bristol, Liverpool, Southampton.
3. Railway rates from York to inland towns to which there is not effective water competition—Leeds, Sheffield, Birmingham. The rates given are for * * * sugar, glucose, cocoa, gum, almonds.

The average of the five rates to these towns is summarized below, the figures being the ratio that the rates to the different towns bear to the maximum rate that the railway companies might charge to these towns.

I.	Per cent.	II.	Per cent.	III.	Per cent.
Goole	81	Bristol	90	Leeds	92
Hull	71 } 78	Liverpool	101 } 97	Sheffield	99 } 99–100
London	82	Southampton	101	Birmingham	107

Commenting on this table and the showing which it makes of rates to places which do, and those which do not, enjoy the benefit of water competition, Mr. Morrell said:

It will be seen from these examples that where there is no effective competition the railway companies are practically charging up to the hilt.

THE WATERWAY TRUST PROPOSALS

Various proposals were submitted to the commission presenting as many ideas how the waterway situation in Great Britain should be improved. There was general agreement that the canals should be divorced from the railways, but wide disagreement as to what should be done with them afterwards. Some witnesses were of the opinion that local "trusts"—that is, organizations of municipal and county

[illegible]

[illegible]

RAILWAYS AND THE MANCHESTER CANAL

[illegible]

has guaranteed the commercial prosperity of Manchester, and it would require some ingenuity to make a satisfactory argument that it has injured either the shipping business of Liverpool or the interests of the railroads.

Yet the British railroads so vigorously opposed the construction of this canal that it took five years of the most determined effort to secure from Parliament a charter for the work. Under this charter the city of Manchester was to find the capital for the enterprise. The national Government had no real concern with the project, except as the efforts of railroad lobbyists attempted to make it appear that there were many reasons why such a canal could not possibly be a success. After it was opened various elements, of which the attitude of the railroads was an important one, made it doubtful for a long time whether the canal would succeed. But latterly the tonnage has rapidly increased and it has begun to pay interest on its capital debt.

A comparison of this seemingly unenlightened policy of the British railroads with the more liberal one of the railroad administrations in European countries seems worth while. Whereas in the Manchester instance the Government was urged to prevent a great city providing itself with a very necessary utility, in continental countries the general Governments not only permit cities thus to provide themselves with facilities, but to go so far as to loan the State's credit to the extent of a large part or even all the cost of such an improvement.

HIGH RATES OF ENGLISH RAILWAYS

English railways are the most highly capitalized in the world, but it is not fair to attribute all the blame for this condition to their managers and corporate policies. The landowners of England from the beginning systematically "held up" railroad corporations for the largest possible prices for lands necessary for right of way and terminals. Because the landowners were a great power in Parliament and were willing to stand together in this matter, the railroads were systematically compelled to pay fancy prices. But whatever may have been the cause, the fact remains that internal transportation in England has become so expensive as to impose a heavy burden on British commerce. A computation made to illustrate this condition reached the conclusion that from an interior point 40 miles from the ocean it cost 22s. 6d. to ship a ton of freight to India, and that of this 12s. 6d. is absorbed by the railroad company for the 40-mile haul to the seacoast. In other words, it cost the shipper about 125 times as much to move a ton a mile by land as by water. Comparing this again with the situation in Germany, it is found that on export business the German railways and interior waterways haul business at almost ridiculously low rates from distant interior points to the seacoast, allowing the lion's share of the total through rate to go to the steamship company, and that, even then, the German through rate is so much lower in many cases than the English that Englishmen find it constantly more and more difficult to compete in foreign trade with Germany.

ERIE CANAL AS AN ARGUMENT IN ENGLAND

Against this insistent demand of English traders for better waterways a variety of arguments are presented. One is that few British rivers are large enough to be useful, even when improved to the utmost. Another is that it would be impossible to connect the British streams by a network of canals, as has been done on the Continent, because there is not a large enough water supply in Britain and the country is too rough. Finally, the history of the Erie Canal in New York has been iterated and reiterated as evidence that waterways really can not compete on anything like equal terms with railroads.

The present-day attitude of progressive and candid communities toward waterways is that, while a small, inadequate, and antiquated waterway may not be able to compete with a great, modern, 4-track railroad, a modern canal handling 1,000-ton barges with steam power is very likely to prove itself an exceedingly important factor in making rates and moving traffic.

The British Royal Commission has not formulated its conclusion or recommendations up to this time. Conjecture as to what they may be is useless. It is certain that because of the parallel between conditions in the United States and Great Britain, the experience of the reconstructed Erie Canal will be studied with immense interest in Great Britain. That canal has been so many times cited as proof of the antiwaterways view that if, when rebuilt, it is able to justify the great expenditure it will have demolished a most potent argument of the British railroads.

WATERWAY MOVEMENT GAINS GROUND

Because there is no system of internal waterways in Great Britain worthy of the name, attempt at description of the routes would be hardly worth while. There is reason for saying that the waterways investigation by the royal commission has developed facts concerning the relations of railroads and waterways, and concerning the comparative cost of transportation by rail in Britain and other countries, which have strengthened the movement for nationalization of railroads in the United Kingdom. Within a few months Lord Brassey, who enjoys large repute in England as a thoughtful student of economic problems, has come out with the flat declaration that, after opposing it for many years, he is convinced that nationalization of railroads is the only plan which promises a solution of the increasingly difficult internal transportation problem.

11. EFFECTS OF THE PURITY OF INDUSTRIAL WATER SUPPLIES ON THEIR USE

By R. B. Dole

United States Geological Survey

In former years, water was water for the practical man if it would flow through a pipe in sufficient amount. But, more and more, has he been obliged to modify his views, previously limited only by the quantity of available water, by considering that part of his production cost due to the use of water unsuitable in quality for his particular manufacturing process. In the adoption of water for domestic supply, one of the most important of the features that affect its value is its potability, which is determined primarily by its freedom from dangerous, ill-smelling or bad-tasting organisms. In the application of water to industrial use, however, biologic features are in the majority of cases rather secondary in importance, and the suitability of the supply is determined by the amount of mineral matter dissolved or suspended in it. This is especially true when waters are used for boiler supply, for papermaking, and for similar purposes. In some industries, such as starch making, brewing, distilling, and ice manufacturing, the hygienic quality of the water supply must be considered as well as its physical and chemical characteristics. All natural waters contain more or less foreign matter, and this relative degree of purity is dependent on the locality from which they come. It therefore becomes important to study the peculiar composition of different waters and their adaptability to various industrial processes.

The following list gives the names of the substances that, dissolved or suspended in water, have to be considered when a supply is utilized for manufacturing purposes:

I.—Suspended matter:

(*a*) Vegetable: Leaves, sawdust, sticks, etc.
(*b*) Mineral: Sand, clay, etc.

II.—Dissolved matter:

(*a*) Vegetable: Resin, gums, tannins, etc., extracted from vegetable matter and seldom differentiated. Usually determined as "organic matter" and "color."
(*b*) Mineral: This is the part of greatest importance, and the different mineral matters are determined as silica, iron, aluminum, calcium, magnesium, sodium, potassium, carbonates, bicarbonates, sulphates, chlorides.

By comparing with each other the figures given in the table that follows it can be seen what great differences there are in the quality of waters from different parts of the United States. Analyses of waters from large rivers have been selected, because they represent an average condition, inasmuch as these streams are formed by the confluence of many smaller ones. Each set of figures is the average of 20 or more analyses of water from the same river at the same place.

Analyses showing the quality of surface River supplies at the Federal Stations

Rivers and Stations	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Chlorine (Cl)	Sulphuric acid (SO_4)	Nitric acid (NO_3)	Total solids
Rivers and Stations	Iron (Fe)	Calcium (Ca)	Magnesium (Mg)	Sodium and potassium (Na+K)	Chlorine (Cl)	Sulphuric acid (SO_4)	Nitric acid (NO_3)	Total solids
Kennebec River, Me.								
Androscoggin River, Me.								
Merrimac River, Mass.								
Connecticut River, Mass.								
Hudson River, N. Y.								
Delaware River, N. J.								
Susquehanna River, Pa.								
Allegheny River, Pa.								
Potomac River, Md.								
Rappahannock River, Va.								
James River, Va.								
Roanoke River, Va.								
Neuse River, N. C.								
Cape Fear River, N. C.								
Savannah River, Ga.								
Chattahoochee River, Ga.								
Tennessee River, Tenn.								
Cumberland River, Tenn.								
Kanawha River, W. Va.								
Ohio River, Ky.								
Cumberland River, Ky.								
Kentucky River, Ky.								
Wabash River, Ind.								
Illinois River, Ill.								
Mississippi River, Minn.								
Mississippi River, Iowa								
Mississippi River, Mo.								
Mississippi River, La.								
Red River, La.								
Arkansas River, Ark.								
Red River, Ark.								
Rio Grande, Tex.								
Colorado River, Tex.								
Sacramento River, Cal.								
San Joaquin River, Cal.								
Columbia River, Wash.								
Snake River, Idaho								
Lake Superior								
Lake Michigan								
Lake Huron								
Lake Erie								
Lake Ontario								
St. Lawrence River								
Great Salt Lake, Utah								
Owens Valley								

* Parts per million and tenths, all parts.

† Parts per million and whole.

Though the list might be multiplied ten or twentyfold from the material at hand, it is possibly sufficient to show that waters from different parts of the country vary greatly from each other in their chemical composition and consequently in their effect upon factory processes.

Since these variations in composition modify for each water its value as a supply, the factory locator has another element of production cost to include in his estimates. If analyses of ground waters were given it would be seen that they are usually much more highly mineralized than surface waters in the same region and therefore less desirable for most industrial uses.

The thoughtful manufacturer who is interested in the reduction of his production cost asks these questions:

1. Does the water that I am using contain anything injurious to my finished product?
2. Would a purer water decrease my cost of manufacture?
3. Where and how can I obtain a better supply?
4. If the water is purified, will the cost of purification be compensated by an equivalent decrease in production cost, due to increased efficiency of machinery or to a higher grade of product?

In a few pages it is intended to state some facts in regard to the principal water-consuming industries in relation to the above questions.

BOILER WATER

The most extensive industrial consumption of water is in the production of steam that is thereafter used as a source of motive power, heat or purified water. A deposit is left in boilers when water is changed to steam. The residue varies in thickness, porosity and hardness, according to the chemical composition of the water that is used. Besides the trouble caused by incrustation, certain substances occurring in natural water corrode or "pit" the boiler tubes and crown sheets, causing leaks, loss of strength, and consequent danger of explosion; other substances in the boiler water may be the cause of foaming.

From various tables of analyses the amount of incrustants in some waters have been calculated; the results are given in grains per United States gallon, parts per million, and pounds per 1,000 gallons.

Average incrustants in boiler waters

Source.	Incrustants.			Non-incrustants (parts per million).
	Parts per million.	Grains per gallon.	Pounds, per 1,000 gallons.	
Lake Superior	50	2.92	0.42	10
St. Lawrence River	115	6.72	.96	20
Lake Michigan	103	6.02	.86	13
Maumee River	360	21.02	3.00	83
Youghiogheny River	363	21.20	3.03	a 68
Missouri River	2,402	140.28	20.04	144
Sacramento River	131	7.65	1.09	26
Delaware River	69	4.03	.58	14
Indianapolis well	323	18.87	2.70	19
Androscoggin River	35	2.04	.29	6
Chicago well	743	43.42	6.20	748
Topeka well	388	22.7	3.24	270
El Paso well	106	6.27	.89	292
La Junta well	378	22.11	3.16	787
Guthrie well	439	25.7	3.7	454
Kansas River	332	19.42	2.77	230

a Free sulphuric acid 20 parts.

The ordinary chemical constituents found in water are usually classified as follows with reference to their effect upon boilers: Constituents that form scale—Mud or suspended matter composed mainly of sand and clay; silica, iron, and aluminum; calcium carbonate and sulphate; magnesium when present as carbonate and sometimes as sulphate. Constituents causing corrosion—Organic acids; sulphuric and hydrochloric acids formed by the decomposition of magnesium salts; sodium chloride; free mineral acids. Constituents causing foaming—Magnesium sulphate and chloride, sodium compounds, organic matter.

Ninety-five per cent of all incrustation is composed of calcium, magnesium, carbonates, and sulphates. A carbonated water forms a soft, porous, and rather bulky deposit that is comparatively easy to remove. A sulphated water forms a hard resistant scale that does not readily transmit heat. When appreciable quantities of magnesium are present, together with both the carbonates and sulphates of calcium, the resulting scale is as hard and resistant as porcelain, clinging to and surrounding the boiler tubes and greatly impairing the efficiency. Scaling is the most common and the most objectionable source of boiler trouble.

Foaming is due to the concentration of the unprecipitated salts in the boiler, where steam is constantly being given off while the mineral salts stay behind in solution.

Three sources of financial loss attendant upon the use of impure water in boilers have already been mentioned:

(1) Incrustation, (2) corrosion, (3) foaming. Complementary to these are (4) increased cost of fuel, (5) increased boiler repairs, (6) increased time for cleaning boilers, (7) shorter life of boilers.

A very definite increase in the cost of fuel is incurred on account of the formation of scale that surrounds the tubes and absorbs a considerable percentage of the fuel energy. It would be a conservative estimate to place the average loss of fuel efficiency at 13 per cent for one-sixteenth inch scale. If the average thickness of locomotive boiler scale in the United States were taken as one-sixteenth inch, a similar conservative margin would be left. It is true that in New England and some other areas of very soft water, almost no scale is formed, but on the other hand, boilers working in the Mississippi basin are very badly scaled, and those in the Southwest are similarly affected. A 13 per cent increase in coal consumption for an ordinary locomotive, which consumes $5,000 worth of coal a year, would mean a loss due to the use of impure water equivalent to $575.22 per annum for every locomotive in the United States.

Practical experience has shown that the use of soft water for boilers is attended by a great reduction in the cost of boiler repairs. Engines are less frequently retubed and incidental repairs on the fire box and flues are saved. On some roads the saving in boiler repairs alone has paid for the construction and maintenance of softening plants.

The worse the waters are the more often the boilers have to be cleaned, and consequently the unproductive period is lengthened. Cooling down and subsequent firing up are the usual accompaniments of boiler cleaning among stationary engineers, and coal consumption is, therefore, increased by more frequent cleaning.

It is well known that locomotives used in regions of soft water last very much longer than those used in regions of hard water. In New England, where bad waters are very uncommon, the life of a locomotive is twenty years or more, the flue mileage is about 200,000 miles and with a little calking they will last for a similar period of time. On roads operating west of Mississippi River in regions of hard and often corrosive waters, new side sheets and fire boxes are generally required each year of service, and the flue mileage rarely ever exceeds 40,000 miles.

On the Pittsburg and Lake Erie Railroad, operating 200 engines over 194 miles of track, the following losses per year were estimated to be due to the use of impure boiler water:

Loss of fuel due to effect of scale, etc	$50,000
Average number of locomotives in shop at all times for repairs and new flues.	17
Ten per cent interest and depreciation on the $230,000 invested in these 17 locomotives	$23,000
Average life of flues ... months..	10
Loss due to shop repairs at $100 per boiler	$20,000
Total excess of operation cost	$93,000

Ninety-three thousand dollars would be sufficient capital in itself to erect and operate for one year several water-softening plants on this road.

On the Wyoming division of the Union Pacific, when the natural waters of the region were used, the average life of a set of flues was six months in a passenger locomotive, and ten to twelve months in a freight locomotive, but after the adoption of artificially softened water, the average life was increased to two and one-half years for engines of both classes; there was also a reduction of 34 per cent in the cost of locomotive repairs per mile traveled.

The increased operation cost per locomotive per annum due to poor water has been summarized as follows, basing the estimates upon experience on roads where hard water was replaced by soft water:

Fuel that might be saved	$150
Excess boiler repairs	300
Excess washing and cleaning	60
Decreased time of service	200
Total increase in cost of operation	710
46,743 locomotives in service in 1904 (Interstate Commerce Commission)..	33,187,530

When it is desired artificially to soften hard water, lime or soda ash, or both, are added in sufficient quantity to precipitate a portion of the incrustants. The proportion of each chemical depends upon the composition of the raw water and the necessary degree of purification. The initial cost of softening plants depends upon the number of gallons per day it is desired to treat. It runs from $5,000 for a plant treating 100,000 gallons per day to $18,000 for a plant treating 1,500,000 gallons per day. The principal item of operating expense is the cost of chemicals. The expense for attendance is small in treating an ordinary boiler water, because the work can be done by the pumper at a railroad water station or by the engineer in a manufacturing plant. The following list gives some idea of the cost of chemicals per 1,000 gallons of treated water:

	Cents.
Between Chicago and Missouri River	1.4
22 plants of the Union Pacific Railroad	1.3
Estimates by Handy:	
Ordinary carbonated water	0.2 to 0.5
For ordinary sulphate water	1.2 to 1.4
General average	1 to 2
Kennicott Water Softener Company	—2
Estimates by Davidson:	
Fair water (about)	1
Maximum for bad water	10

As an example of what can be accomplished by artificial softening, the incrustating solids in two waters before and after treatment are given:

	Pounds of incrustants per 1,000 gallons.	
	Before.	After.
Union Pacific supply, North Platte, Nebr	2.76	0.76
Northwestern supply, Council Bluffs, Iowa	6.69	.51

The incrusting solids in the water at North Platte were reduced 2 pounds per 1,000 gallons, or, with a daily consumption of water 180,000 gallons, 5.4 tons per month of solid matter were removed from the water before it was used instead of being shoveled, washed, or hammered from the inside of the boilers.

For an example of what may be accomplished in the decrease of the production cost, the estimate below has been devised. From analyses of Maumee River water that have been quoted it is seen that the incrusting solids amount to 360 parts per million, 105 parts of which are suspended mud, etc., and the rest carbonate and sulphate of calcium, with some magnesium, an excellent combination for the formation of a hard scale. If this water were used in a 1,000-horsepower boiler 100,000 gallons daily would be required; in 6 working days 1,800 pounds of scale would be deposited in the boilers. The first set of figures estimates the probable excess cost due to the use of bad water, while the second estimates the probable cost after purifying the water; the inference to be drawn from the difference in dollars and cents is obvious.

Average coal consumption for 1,000-horsepower boiler, 48 tons a day; 48 tons of coal, at $1.50, is $72. Estimated saving in fuel on this water, due to use of treated water, is 5 per cent.

HARD WATER

5 per cent of $72 is $3.60 per day, or 300 working days	$1,080
Cleaning boiler, at $8 per week	416
Repairs for tubes, etc	200
Boiler compounds	250
Coal for raising steam after cleaning, 104 tons, at $1.50	156
7½ per cent depreciation on boiler plant costing $15,000	1,125
Total	3,227

SOFT WATER

10 per cent interest and depreciation on softening plant costing $3,500	$350
Boiler repairs	50
Chemicals at 1 cent per 1,000 gallons	300
Coal for raising steam after cleaning, 16 tons, at $1.50	24
5 per cent depreciation on boiler plant costing $15,000	750
Total	1,474

Total saving per year, $1,753, which is 50 per cent of the total cost of installing the softening plant.

WATER IN PAPER MAKING

Since paper ranges in quality from the finest white writing paper to the coarsest of strawboard, it is evident that the production cost due to impure water will vary according to the quality of the product. Turbid waters are universally injurious in paper making, and the majority of firms have trouble with hard water. Calcium and magnesium weaken the solution of the resin soap by partly decomposing it. Iron causes rusty spots on white and tinted papers. Vegetable coloring matter produces streaks or dull shades in fabrics that should be white. Acid waters decompose the colors, corrode the wire screens, and attack the felts. For the manufacture of all the finer grades of paper, careful water purification is necessary. Therefore the cost of impure water in this industry may be estimated by the cost of purifying it.

The general method of purification is sand filtration with or without alum coagulant. The cost of installing the filters ranges from $300 to $13,000 for a capacity of 1,000,000 gallons a day. The average cost is about $5,000 per 1,000,000 gallons per day. The cost of maintenance varies from 50 cents to $10 per 1,000,000 gallons. One very careful estimate from a company operating over 50 mills gives the average annual cost of purification as $300 for a plant using 1,000,000 gallons every twenty-four hours. A conservative estimate for the average consumption of water is 140,000 gallons per ton of finished product, or, in other words, 12 cents per ton of paper is that part of the production cost due to the use of impure water. Basing an estimate on 2,980,000 tons, the amount of paper made in 1905, it cost the paper mills of the United States $342,700 to use impure water, an amount equal to $\frac{18}{100}$ per cent of the total value of the products.

OTHER INDUSTRIES

There are many other large and important industrial processes into which impure water enters as part of the production cost. A few of them are given: Bleacheries, dye works, canning factories, pickle factories, creameries, slaughterhouses, packing houses, nitroglycerin factories, distilleries, breweries, woolen mills, starch factories, sugar works, tanneries, glue factories, soap factories, strawboard mills, chemical works.

In all factories of these types the use of impure water is attended by a more or less definite increase of cost production.

DOMESTIC WATER SUPPLIES

A manual published by M. N. Baker in 1897 reports the number of cities and villages fully or partly supplied with public waterworks as 3,942. Since that year there has been such activity in the line of sanitary improvement that the number of waterworks systems has possibly been doubled or tripled. The urban population of the United States is now about 45,000,000. If it be considered that a majority of these persons live in settlements equipped with public water supplies, then multiplying this figure by 100 gallons per capita per day, a low average consumption, it would be found that over 4,500,000,000 gallons per day are used for domestic supply in the United States. This would be an annual consumption of 1,500,000,000,000 gallons, an amount equal to 3 per cent of all the water that flows over Niagara Falls; assuming a velocity of 5 feet per second, it would require a pipe 41 feet in diameter to carry the water; or a river 150 feet wide and 15 feet deep with an average stream velocity of 3 feet per second.

EFFECTS OF IMPURITY ON DOMESTIC SUPPLIES

The factors that may affect the value of a public water supply, making it dangerous, uneconomical, or merely unpleasing, have been very carefully reviewed by George C. Whipple who has devised formulas for calculating in dollars and cents the financial loss due to impurities.

A water for drinking must be free from all poisonous substances, such as lead, arsenic, zinc, etc.; it must be free from bacteria or other organisms that are likely to cause disease, such as the bacilli of typhoid fever or dysentery; it must be free from bacteria of fecal origin. It must also be clear, colorless, odorless, and fairly free from objectionable chemical substances and microscopic organisms. It must be well aerated and of fairly low temperature.

A supply should be low in mineral salts. Hardness makes a water troublesome in laundries and for bathing; iron makes stains in the laundry; chlorine corrodes pipes. Some other salts are troublesome.

Mr. Whipple estimates the sanitary quality from the amount of typhoid fever; the attractiveness from the color, odor, and turbidity; he also calculates the depreciation due to hardness and to temperature.

The formulæ are quoted:

Depreciation due to sanitary quality—

$$D=2.75\ (T-N)$$

Depreciation due to physical characteristics—

$$D=20\frac{p_c+p_t+p_o}{100}$$

$$p_c=\frac{c}{2}$$

$$p_t=5\sqrt{t}$$

$$p_o=22\ O^2{}_v+3.5\ O^2{}_d+5\ O^2{}_o$$

Depreciation due to hardness—

$$D=\frac{H}{10}$$

Depreciation due to temperature—

$$D=\frac{(d-45)^2}{180}$$

in which

D = the depreciation value in dollars per million gallons.
T = typhoid fever death rate per 100,000.
N = typhoid fever death rate assumed to be due to causes other than water, and which may be ordinarily taken as 20 per 100,000.
p_c = per cent of consumers who object to the color of the water.
p_t = per cent of consumers who object to the turbidity of the water.
p_o = per cent of consumers who object to the odor of the water.
c = color reading.
t = turbidity reading.
O_v = odors due to vegetable matter, expressed according to standard numerical scale.
O_d = odors due to decomposition, expressed according to standard numerical scale.
O_o = odors due to microscopic organisms, expressed according to standard numerical scale.
H = hardness of water in parts per million.
d = average temperature of water during four warmest months.

An application of these formulæ to the water supply of Philadelphia shows their practice value.

Source of supply, Schuylkill River without filtration; typhoid fever in 1905, 51.1 deaths per 100,000 inhabitants; turbidity, 150 parts per million; color, 10 parts per million; odor, 3 v + 2 m; per cent of objecting consumers, 102; hardness, 179 parts per million.

Depreciation due to—	Per million gallons.
Sanitary quality	$55.52
Physical characteristics	20.40
Hardness	17.90
Total	93.82

Assuming a daily consumption of 140,000,000 gallons, this would mean an annual loss of $4,794,000, the interest at 5 per cent on about $96,000,000.

The average value of one human life sacrificed by typhoid is about $5,000. For each death 10 to 20 persons are sick with the disease and cost about $100 each for medical treatment, nursing, medicine, etc. But other sicknesses besides typhoid fever are caused by impure water supplies, so that every death reported from typhoid fever is equivalent to a loss to the community of not less than $10,000. The annual losses from insanitary water supplies in some of the large cities of the United States may be seen from the following table, remembering that each death means a loss of $10,000:

Mortality table of typhoid fever, 1905, in the larger cities reporting to the United States Census Bureau

[Cities of 100,000 population and over]

City.	Deaths.	Population.	Rate per 100,000.
Allegheny, Pa	181	142,848	126.7
Baltimore, Md	195	546,217	35.7
Boston, Mass	124	595,380	20.8
Buffalo, N. Y	92	376,914	24.4
Chicago, Ill	329	1,990,750	16.5
Cincinnati, Ohio	141	343,337	41.1
Cleveland, Ohio	65	437,114	14.9
Columbus, Ohio	121	142,105	85.1
Denver, Colo	61	150,317	40.6
Detroit, Mich	69	325,563	21.2
Fall River, Mass	12	105,762	11.3
Indianapolis, Ind	64	212,198	30.2
Jersey City, N. J	46	232,699	19.8
Kansas City, Mo	110	179,272	61.4
Louisville, Ky	110	222,660	49.4
Memphis, Tenn	41	121,235	33.8
Milwaukee, Wis	71	312,948	22.7
Minneapolis, Minn	64	261,974	24.4
New Haven, Conn	51	119,027	42.8
New Orleans, La	101	309,639	32.6
New York (aggregate)	641	4,000,403	16.0
Newark, N. J	40	283,289	14.1
Omaha, Nebr	30	120,565	24.9
Paterson, N. J	16	111,529	14.3
Philadelphia, Pa	724	1,417,062	51.1
Pittsburg, Pa	393	364,161	107.9
Providence, R. I	40	198,635	20.1
Rochester, N. Y	21	182,022	11.5
St. Joseph, Mo	9	115,479	7.8
St. Louis, Mo	144	636,973	22.6
St. Paul, Minn	21	197,023	10.7
Scranton, Pa	20	116,111	17.2
Syracuse, N. Y	20	117,129	17.1
Toledo, Ohio	71	155,287	45.7
Washington, D. C	.....	302,883	48.2
Worcester, Mass	27	128,135	21.1
	4,265	.....	33.5

The following tables, showing a difference in typhoid death rate between cities having polluted supplies, and those having fairly well-protected supplies, is significant:

Cities receiving supplies from uplands or lakes or filtered river waters

City.	Source of supply.	Population.	Deaths in 1905.	Rate per 100,000.
Boston	Rivers and ponds (conserved)	595,380	124	20.8
Buffalo	Lake Erie	376,914	92	24.4
Chicago	Lake Michigan	1,990,750	329	16.5
Cleveland	Lake Erie	437,114	65	14.9
Detroit	Detroit River (near Lake St. Clair)	325,563	69	21.2
Fall River	Purified river water	105,762	12	11.3
Jersey City	Upland	232,699	46	19.8
Milwaukee	Lake Michigan	312,948	71	22.7
New York	Croton River and other supplies; property protected.	4,000,403	641	16.0
Newark	Purified upland	283,289	40	14.1
Providence	Pawtuxet River (conserved)	190,635	20	20.1
Rochester	Hemlock Lake	182,022	21	11.5
St. Louis	Mississippi River (filtered)	636,973	144	22.6
St. Paul	Wells and lakes	197,023	21	10.7
Scranton	Upland	116,111	20	17.2
		9,983,586	.....	17.5

Cities having supplies from rivers, receiving raw water directly from rivers, or from streams and gravel, subject to pollution

City.	Source of supply.	Population.	Deaths in 1905.	Rate per 100,000.
Allegheny	Allegheny River (polluted)	142,848	181	126.7
Cincinnati	Ohio River (polluted)	343,337	141	41.1
Columbus	Scioto River (polluted)	142,105	121	85.1
Indianapolis	Gravel and White River mainly (polluted)	212,198	64	20.2
Kansas City, Mo.	Missouri River (polluted)	179,272	110	61.4
Louisville, Ky.	Ohio River (polluted)	222,660	110	49.4
Memphis	Wells in gravel (partially purified)	121,235	41	33.8
Minneapolis	Mississippi River (polluted)	261,974	64	24.4
New Haven	Small streams (polluted)	119,027	51	42.8
Omaha	Unfiltered Missouri River	120,565	30	24.9
Philadelphia	Schuylkill River (polluted)	1,417,002	724	51.1
Pittsburg	Monongahela and Allegheny rivers (polluted)	364,161	393	107.9
Toledo, Ohio	Maumee River (polluted)	155,287	71	45.7
Washington, D. C.	Potomac (before filtration)	302,883	129	48.2
		4,104,614	.....	54.5

12. APPLICATIONS OF WATER POWER

By W. E. Herring
Engineer, U. S. Forest Service

The application of great water powers to the industrial wants of distant cities is less than ten years old and is still in its infancy, yet in this short space of time plants supplying a large number of cities in the United States with a combined capacity of hundreds of thousands of horsepower have been installed. To reach these industrial centers the water power is electrically transmitted, and in many cases the distance is over 100 miles. This method of utilizing water power has been made possible only by long distance transmission. Fifteen years ago 10 miles was the limit to which electrical power could be transmitted, but at the present time 150 miles is very common and in one case a line of 200 miles is in use. This fact has been the greatest incentive to such water-power developments.

Cheap and convenient power conduces more to the growth of a community than any other single item. Industrial operations have more and more been drawn toward those localities where power is easily procured, well illustrated by the tendency to locate large manufactories in regions where fuel is plentiful and cheap.

The chance of commercial success is the first subject of investigation in any proposed water-power development and the problem is whether or not power can be furnished at a slightly lower price than the prevailing rate and still give a good return on the capital invested. This depends upon the available market, its distance from the plant, and the price current in that market for power. With this then arises the question as to whether the available flow is sufficient to produce the power required at the time of maximum load or not, for if not, it is necessary to resort to storage, which increases the cost very materially; yet, if only the available flow of the stream during a certain portion of the year could be devoted to the purpose of generating power, many of the large plants could not be utilized. On the other hand, however, if all the water carried in the stream could be made to do work and at the same time the water could be utilized in maintaining navigation, in irrigating, or some other important duty, then such powers need only development to be commercial possibilities.

Water power is not always cheaper than steam, but generally it is, and by an amount which will allow of its being transformed into electrical energy and transmitted to the point of use. Its advantages over steam power are the saving of fuel, smaller cost of building for a given capacity of plant, and less cost for labor.

The location of an available site is first purchased outright, and if storage is to be resorted to, title is obtained to all land that will be submerged. This step gives absolute control of that particular site. Should it happen that the flow is sufficient to furnish a large development and only a portion of it is used, the balance is allowed to waste, as no concern which might be a rival is allowed to make use of it. It is thus a monopoly at that particular point. Owing to the low cost of the power and the distance to which it can be transmitted, such sites are in demand and it is almost impossible at the present time to find a suitable site within a reasonable distance of a market for such a plant in the northwestern States, or on the west side of the Sierra Nevada Mountains which has not already been appropriated.

A splendid illustration of the extent to which such water-power development is being monopolized is given in California, where, of numerous rights of way granted for ditches, reservoirs, pole lines, and other power purposes in three of the land districts, 65 per cent are controlled by three companies. One of the largest companies in the State is selling power in comparatively large units at 1½ cents per kilowatt hour for twenty-four-hour service, or at about $98 per horsepower per annum. Another consumer of over 1,500 horsepower pays 0.9 cents per kilowatt hour for twenty-four-hour service or at the rate of $58.83 per horse-power year. So far as known, this is their lowest rate made to a consumer.

On four of the rivers in northern California where there is a possible development of over 800,000 horsepower, only 20,000 has been actually utilized, while speculative water rights are held on these streams from which over 566,000 horsepower could be developed; or in other words 75 per cent of the power possibilities on these streams have been alienated from public ownership and less than 2 per cent utilized for useful purposes. The extent to which the control of such plants is passing into the hands of a few of the larger companies is also well illustrated in California, where 4 of the largest companies have a combined capital of $55,000,000, and operate 30 hydroelectric plants and 18 steam plants. The largest one of these companies supplies power to 26 individual lighting companies and 12 electric railway companies, in addition to a number of cities and towns where it has its own substations.

North of Bakersfield, Cal., there are now in operation hydroelectric plants with a combined capacity of over 150,000 horsepower, while south of this point there are about 50,000 horsepower more, making a total of over 200,000 horsepower in the State.

The Bureau of the Census, in its last report on electric powers in the United States, shows an increase from 1900 to 1905 of 270 per cent in the amount of electric power in use, a majority of which is probably generated by water power. In the same report they show a total to January 1, 1905, of only 598,900 total horsepower in electrical-transmission plants which includes only the large ones. This is obviously too low, as the total given for California is only 119,500 horsepower and in reality the total was greater than this by at least 40 per cent. Up to the same date they show a total in the United States of 1,647,969 horsepower developed from water power alone. As this amount is not separated it is impossible to tell what per cent is used for developing power to be transmitted electrically.

It requires a large outlay of capital to secure and hold these locations, and unless the entire situation at the particular point in question can be controlled it is not feasible to obtain the necessary funds.

Over 40,000 horsepower is transmitted from the Niagara Falls development to Buffalo, of which more than 20,000 is used in manufacturing and industrial works. When such plants can furnish power at a less cost than it can be furnished in other ways, the market for power is monoplized and the development of such plants becomes a monopoly.

The monopoly of water power affects every individual within that territory, for the reason that it has to do with the commodities of everyday life. Heat, light, and power, particularly the two latter, are practically controlled by such a monopoly. Prices are usually not based upon a fair return from the amount invested, but are so arranged as to be slightly less than the cost of furnishing the same item when steam is used.

The expansion of electric water-power systems has been much greater, as a rule, than that of electrical supply from steam-driven stations, and that the power is cheaper is well illustrated in Buffalo, where over 7,000 horsepower transmitted from Niagara is used in place of steam in the street-railway lines of that city. One of the largest single users of such power in Southern California is one of the street-railway lines in Los Angeles, which uses 2,000 horsepower, part of which is brought a distance of 118 miles and yet is cheaper than steam power. The companies developing such power in California, for instance, furnish power to the street railways, manufacturing plants, and factories, and to many small consumers for pumping water for irrigating purposes, motive power for machinery on the farms, and lights in the farm house, small town, and city. Thus it is seen that all classes are affected by such a monopoly and that each contributes to its support. In New York State, where fuel is cheap, power is supplied from hydro-electric plants at $20 per horsepower per year for twenty-four hour service. In North and South Carolina the average charge is $15 per horsepower per year for sixty-six hours per week. Compare these prices with those in California, where one of the largest producers of such power charges its largest consumer (averaging over 2,000 horsepower) at a rate of approximately $53 per horsepower per year, and the smaller consumer pays more than twice this amount. The difference arises from the variation in the price of fuel and not altogether from the difference in the initial costs of the developments. Surely no one will argue that there is any good reason for a difference of $35 per horsepower year in the amounts paid by the consumer. Even should there be a difference of as much as $100 per horsepower in the installation this would only account, at 6 per cent per annum, for $6 of the difference.

The actual cost of production of power with steam is very hard to determine, but the most patient and searching investigations show that, on a basis of 500 net horsepower delivered ten hours per day and 308 days per year, the cost, with coal at $3 per ton, varies from about $36 for a simple high-speed engine, to about $25.50 for a triple expansion, condensing low-speed engine. In units of 50 horsepower the cost per horsepower ten hours per day may easily be $75, and in regions where fuel is high, or if the engines are not run economically, the cost may mount up as high as $150.

With a working year of three thousand and eighty hours the cost of steam power in units up to 20 horsepower is seldom below 5 cents per horsepower hour. Above 20 and up to 100 horsepower the cost is less, but seldom below 2½ cents per horsepower hour. . Over 100 horsepower the cost decreases, but even in the largest developments is not often less than 1 cent per horsepower hour. These figures assume practically continuous working; if it is intermittent the cost of course is increased. With a 20,000-horsepower plant, coal at $2.25 per ton, and a fairly long distributing system, the actual cost per horsepower year is $33.

Since the water power can be and is sold for as low as $20 per horsepower year when necessary to secure the business, it is self-evident that the actual cost of electrically transmitted water power as a general rule is much less than steam. One of the nicest points in operating such a plant is the correct adjusting of the prices of such power to the existing market, for it is not easy to find the happy medium between the cost of this power and other power which will allow of the maximum net profit.

It has been estimated that every person in the United States uses annually about $7 worth of electricity in some form. Trolley rides lead at $3 per capita, and electric light is second with $1.50 per capita. This gives a very good idea of the interest each individual has in such developments.

13. RELATION OF WATER CONSERVATION TO FLOOD PREVENTION AND NAVIGATION IN OHIO RIVER

By M. O. Leighton

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[A discussion of the possibilities of preventing floods and maintaining navigable depth by the establishment and maintenance of reservoirs in highland tributaries of great rivers, based on an investigation of such possibilities in the basin of Ohio River]

INTRODUCTION

This report will be confined to a statement of possibilities. There will be no attempt to prescribe methods for treatment of each local modifying condition that will be encountered in the prosecution of the plan here proposed. Such features are merely collateral, and their proper disposition is a matter of ordinary engineering. It is not expected that the facts here set forth will refute all the objections made in past years to the conservation scheme. Such, indeed, is not the object. The paper will have served its purpose if it demonstrates that the plans proposed have so many features of promise that it would be a grave mistake to recommend the permanent adoption of a governmental policy that did not recognize the possibilities and provide for a further and more minute investigation of them.

Briefly stated, the contentions are as follows:

First. That the logical way to control a river is to control the sources of its water supply.

Second. That in nearly all of the rivers of the United States such control can readily be effected by the construction of storage reservoirs.

Third. That the way to prevent floods is to use these reservoirs to catch and temporarily hold the flood waters, so that they will not descend upon the lower valleys in so large unit volume.

Fourth. That in the majority of cases the improper and illogical way to attempt the control of floods is to endeavor to confine the rivers between high and expensive levees.

Fifth. That except along those portions of river channels that are too steep for open navigation, the proper way to maintain navigable depth at the low-water season is to provide, if possible, for the intelligent release of stored water.

Sixth. That canalization of rivers should be the resort only along those portions of the channel too steep for open navigation or in the tributary basins of which sufficient flood water can not be stored to maintain navigable depth at low water; further, that when such results may be derived from storage reservoirs, canalization is disproportionately expensive in maintenance and the money so expended might be used for more useful purposes in the uplands.

Seventh. That, while the first cost of the proposed conservation system will be large, the burden will be widely distributed over a series of years necessary to complete the construction.

Eighth. That the ultimate cost will appear nominal when compared with the enormous benefits conferred, these benefits being applied to water power and to irrigation, as well as to flood prevention and navigation.

The general proposition in this paper is not new. It was proposed by a British engineer in the year 1800, and in this country by Mr. Charles Ellet, jr., nearly sixty years ago. An interesting discussion ensued at the time, which was apparently brought to a close in 1857 by a report of Mr. W. Milnor Roberts. So effectively did Mr. Roberts dispose of the matter that at that time the policy of the Government appears to have been well-nigh crystallized. Whether or not Mr. Roberts's contentions were correct, he enlisted the approval of so many engineers that even at the present time when one advocates the conservation scheme he is almost certain to be met with the question "Have you read the report of Milnor Roberts?" Therefore it will be profitable to review briefly the points of objection made by this distinguished engineer.

In the first place, it should be borne in mind that the report of Mr. Roberts was presented in the year 1857, when the country tributary to Ohio River was, so far as special topography and reservoir facilities are concerned, practically an unknown region. At the outset of his presentation Mr. Roberts made a very sensible observation that applies with equal force to-day, viz:

> The question is not merely one of dollars and cents that may be involved in the adoption and completion of a particular plan; it is of the first consequence that that plan shall be one with which the sober good sense of the country will rest satisfied and which in the end will be productive of the greatest benefit.

In considering the objections of Mr. Roberts the author will use an abstract of the same made by Maj. William E. Merrill, Corps of Engineers, the successor, friend, and supporter of Mr. Roberts. This abstract appears in the Report of the Chief of Engineers for 1873, volume 1, pages 500 to 501, inclusive.

First. "Six such sites can not be found on the headwaters of the Ohio and an increased number of smaller reservoirs would be needed."

Mr. Roberts's criticism here is a reply to Mr. Elwood Morris, an engineer who, in support of the ideas of Mr. Ellet, calculated the effect of such storage on Ohio River by assuming hypothetically the existence of 6 reservoir sites, each capable of conserving the drainage from 600 square miles. Indeed a large part of Mr. Roberts's report is devoted to a demonstration of the fact that 6 such sites are not to be found in the Ohio basin. Mr. Morris merely assumed the possibility of sites for these reservoirs for purposes of calculation.

Second. "These dams would destroy all raft or flatboat commerce above them. Arrangements that might be made to provide a passage by chute would not answer when the reservoir was not full, which might often happen."

The conditions of traffic that allowed this objection to be taken seriously have now passed. At present the conditions of transportation are such that we are not giving much thought to raft and flatboat commerce on the highland tributaries of any stream.

Third. "There would be great danger of breakage from unforeseen leaks or accidents. Reservoirs constructed on dry ground have sometimes broken and the danger is much greater in a running stream. Should one such dam break it would probably carry all others lower on the same stream and pour a frightful wave of destruction on the valley below. The possible loss of life and property that might ensue is beyond all estimate."

We know more about reservoirs than in those days. There are, of course, possibilities of breakage, but this has not inhibited the development of reservoir systems. Every piece of construction made by man is liable to failure. Life itself is hazardous. If the objections here recorded were used consistently with reference to all modern economic development, mankind would be crouching on the ground in the open country, shaken by apprehension. Every feature of our development makes it necessary to assume hazards, and modern engineering has rendered the reservoir so safe that, as a agent of violent death, it can not be placed in the same class with the ordinary morning stroll down the streets of a great city.

Fourth. "The damages on account of farms overflowed, towns, oil wells, and manufacturing establishments submerged, railroads compelled to rebuild their lines on higher levels so as to get above the dams, and similar injuries would add very greatly to the cost of the system."

It is true that there would be submergence, yet one is compelled to reflect whether more farms, towns, oil wells, and manufacturing establishments would be submerged beneath the reservoirs than are annually submerged by the unrestrained floods. With reference to railroad lines, the relocation of them does not appear to us so formidable as it did in those days. Indeed, it is an ordinary incident in railway maintenance. The whole objection assumes that enormous losses are to be entailed by such submergence, whereas, in point of fact, reservoirs are constructed in regions not highly developed in this way and where the cases of submergence are merely incidental. One might as well consider the cost of the large consumption of ink as a reason for discontinuing the publication of newspapers as to consider the above objection as fatal to economic reservoir construction. No sane man would advocate the construction of a reservoir in places where the cost of submergence would be excessive.

Fifth. "The utmost care would be necessary in the management of these reservoirs to prevent injury by sudden floods, and terrible disasters might ensue from carelessness or bad judgment."

This indictment is accepted. We are all subject to the good judgment and management of our friends and associates in the controlling conditions in our everyday life, and it is to be presumed that each man will do his duty. Whether we travel or remain at home we are constantly subject to the operation of utilities that can not be made fool proof, and there is no reason for assuming that the management of reservoirs is extrahazardous. On the contrary, it is a comparatively simple matter.

Sixth. "The proper use of the reservoirs would be very difficult in order to keep up the exact depth needed for navigation, as any mistakes in regulating the supply would seriously embarrass navigation. Special telegraph lines would have to be constructed to all

reservoirs, and widely extended observations on the rainfall and the conditions of all tributaries would be needed in order not to waste nor to unduly economize the supply."

We are ready to meet all of Mr. Roberts's requirements in this matter. We have extended observations on the rainfall and the conditions of all tributaries, and we could do even better than he suggests in the way of communication, for we could supply telephones. It is readily recognized that this objection is antiquated and not worth considering in the light of modern improvements.

Seventh. "The cost of the reservoir system would be very great and could only be estimated by careful examinations at each site selected. Estimates based on a specially favorable site could not be depended on."

All this is accepted as one of the trival incidents of reservoir construction. Of the cost we shall speak later on.

Eighth. "The whole thing is an enormously costly experiment, and would require the continuation of the present system of improvement by riprap dams and dikes in order to utilize the water delivered.

It is true that the system would be costly, yet, as will be shown later on, the relative cost compared with the benefits derived would be small. It is a well-known precept of modern business life that values are not determined by cost, and nothing may be considered costly that returns a reasonable income on the investment. Some things would be costly if purchased for a farthing. With reference to the scheme being an experiment, that which may truly have been considered an experiment in the day of Mr. Roberts may now be a well-attested reality. The scheme is not an experiment, as will be shown later on. One of the purposes of this paper is to show that Mr. Roberts was wrong in his assumption that complete channel improvement would still be necessary if reservoirs were constructed. Indeed, the reservoir is urged as a substitute for such works under certain conditions.

While the objections above cited may have been important at the time they were enunciated, it is clear that they are of little consequence at the present time. The whole matter is brought down to a question of fact, namely, is there available on the highland tributaries of the Ohio sufficient water supply and storage capacity to prevent floods and to maintain deep-water navigation during seasons of low water. Mr. Ellet did not have the necessary information at his disposal, and therefore could not prove his contentions. Mr. Roberts confessed that he did not have it, but endeavored and, in fact, succeeded in discrediting the idea without it. We are now in possession of it for certain areas, as a result of the investigations of the United States Geological Survey and the United States Weather Bureau, and can readily establish certain crucial points that were left in doubt in the earlier discussion.

It will be appreciated on examination of this paper that the region considered does not cover the entire basin. Therefore this presentation can not do entire justice to the situation. Whatever results may appear to be claimed as arising from the construction of these reservoirs with reference to the effects of floods and the maintenance of low-water navigation on the Ohio, they do not represent the total possibilities of the region, for, were surveys available on all the basin, it is manifest that far greater storage facilities would be shown to be available.

Therefore the maximum effect of conservation would be much greater than shown in the following pages.

It will be helpful now to consider an objection that is frequently made to the use of storage reservoirs for flood prevention purposes, viz, that there is no way of predicting when floods may come, and it would be certain that a flood would descend on the reservoirs when they were filled to overflowing with the run-off from a previous flood. Now, the records of floods during the past twenty or thirty years on the Ohio indicate that, while they may not be predicted within a few days, they do occur during certain seasons of the year, and therefore the problem is narrowed down to that extent. But, supposing this were not so, the effect of the reservoirs would not be diminished. It will be noted in subsequent pages that the extent of drainage area that can be conserved by various reservoirs has been determined. The reservoirs will hold the entire year's run-off from a stated area, or, in other words, if the gates of the reservoirs were allowed to remain closed for an entire year the reservoirs would retain all the water flowing from that territory for the entire period. Supposing now that two floods should descend into the Ohio River, as they did in January and March, 1907. The second flood could not descend on full reservoirs because the capacity of the reservoirs is sufficient to hold them both. We have, for example, on the Monongahela storage facilities of capacity sufficient to conserve the run-off of 38 per cent of the drainage area.

Therefore, according to the adjusted capacities stated in the following pages, this per cent of the Monongahela drainage area could be entirely cut off from the Ohio Valley for the period of one year. Of course, this estimate is based on the records of mean flow, as shown by observations extending over a series of years. There is considerable variation from one year to another, so that if the reservoirs actually remain closed there are years in which the accumulation of water would more than fill them and still other years in which the accumulation of water would not suffice to fill them. But the point is that this great capacity furnishes a wide margin on which to work. The two floods of the spring of 1907, for example, would not fill these reservoirs, but, assuming that they remain closed for the entire year, it is possible that the entire year's run-off would more than fill them. But, with this wide margin of time, covering, indeed, a low-water season, when the water would be needed in the Ohio, there is ample time to draw off the water and prepare the reservoirs for subsequent floods. Therefore, the criticism that floods might descend upon reservoirs already filled is based on the hypothesis that the reservoirs are small and their capacity is not commensurate with the size of the basins, whereas, in point of fact, they are sufficiently large for flood prevention. The whole matter therefore comes down to intelligent manipulation, with margins of safety so wide that only the most flagrant stupidity could result in any misfortunate circumstance.

A further question now to be discussed is, How are we going to manipulate the reservoirs above which there is a large drainage area when their capacity is only sufficient to hold a portion of the flood descending from that area? A glance at the tables in subsequent pages will show that there are many such. This is a mere

matter of intelligent manipulation. We will assume, for example, that there is, above a certain reservoir, a drainage area of 100 square miles, while the reservoir itself has a capacity sufficient to conserve the run-off from only 50 square miles. This does not make it necessary that the run-off from the 100 square miles shall come down and overwhelm the 50-square mile reservoir. The fact should be kept in mind that this reservoir is to conserve the drainage from only 50 square miles and therefore as fast as the flow comes down into the reservoir one-half of it should be released through the gates. The release of one-half of the water may readily be accomplished by adjusting the size of the openings in the reservoir gates. The same effect could be readily produced if the drainage area above the reservoir were 1,000 square miles in extent and the reservoir capable of conserving only 10 square miles. The flow into the reservoir from the upper channel can readily be rated, and it can be known at any time from observation of the gauge how much water is coming into the reservoir. Knowing the proportion of the drainage area which the reservoir will conserve, it is merely necessary to raise or lower the gates, so that the portion which it is not intended to conserve may be discharged from the reservoir as fast as it comes in. The computation of the proper amount is a simple engineering calculation and would not require expert manipulation on the ground. Simple directions based on these calculations could be given to any intelligent man, so that he could manipulate the gates of the reservoir according to the amount of water coming in, in precisely the same way as the unprofessional attendant of reservoirs on city waterworks is instructed by a few simple rules to manipulate the gates according to the consumption. These considerations, it is believed, will dispose of the oft-repeated assertion that a second flood need descend after a first and upon full reservoirs.

Another preliminary statement should be made before passing to the consideration of the detailed facts concerning the reservoir system. It will be admitted that the reason why a river will overflow its banks is because so great an amount of water is turned into the channel within a short space of time. If the total annual flow of a river were uniform there would be no floods. It is the great influx of water derived from heavy rains and quickly melting snows that overtaxes the channel. The question now arises, What are the factors that control the speed with which run-off water is discharged into river channels? The answer is plain, namely, The slope of the tributary country and the condition of the land surfaces. It is clear that the water of precipitation will run off the side of a mountain more quickly than off the surface of a plain. Therefore, it must also be clear that the most destructive part of a flood originates in the steeper part of the drainage area, and consequently, if the speed of this part of the run-off could be inhibited the severity of floods would be greatly reduced. Bearing this in mind, it will now be profitable to consider what portions of the various drainage areas of Ohio River tributaries it is proposed to conserve in the present instance. A glance at the locations will show that almost invariably it is these quick-spilling upland areas above referred to, but it should be noted that a reservoir system does not merely inhibit the run-off from these steep areas, but actually holds and conserves it. It is the lower, flatter portions of drainage areas that remain unobstructed. The

situation is ideal, because these lower portions are the least troublesome. The purport of the above suggestions is as follows: It has been stated in a previous paragraph that the reservoir facilities on the Monongahela basin will, if developed, absolutely conserve the run-off from 38 per cent of the drainage area. Other things being equal, it might be stated that the reduction in flood height would be, broadly speaking, a like proportion. Actually, however, the reduction will be far greater than this, because, as above demonstrated, it is the quick-spilling portion that will have been conserved and the more moderate portion that will remain unobstructed. Therefore, in connection with all statements hereinafter made concerning the reduction of flood height by reservoirs it should be borne in mind that the proportion stated is by no means as great as that which will occur in actual practice.

RESERVOIR FACILITIES IN THE OHIO BASIN

Ohio River is formed by the junction of the Allegheny and Monongahela rivers at Pittsburg, Pa. On the Allegheny basin the lack of suitable surveys prevents a full estimate of reservoir possibilities, and those here presented do not cover the entire basin and should not be so interpreted. The Monongahela basin, on the other hand, has been thoroughly surveyed and the amounts stated in the following paragraphs probably represent maximum conservation. In other words, on these two, as well as on the remainder of the tributaries, all the available information is given, and deductions are here made on that basis.

We will now discuss briefly the characteristics of the various highland tributaries of the Ohio, their water resources, and their availability for storage-reservoir installation.

ALLEGHENY BASIN

The Allegheny basin is 11,400 square miles in extent. The greater part of the area is steep and quick spilling and the deforestation has been quite extensive. The river is subject to wide range of stage and floods are frequent and severe. Except on the lower 25 miles of the river, the principal traffic consists in the downstream transportation of timber and lumber products. The project for improvement of the river contemplates the removal of bowlders and snag obstructions, and the construction of low dams and dikes to close secondary channels and concentrate the low-water flow on shoals. The amount expended under this project to the close of the year ending June 30, 1906, was $260,750, fully one-half of which was applied to maintenance. The work done has not increased the depth of water, generally speaking, except where dikes or dams have been built, but the removal of the obstructions has made it possible to utilize the entire flow of the stream, so that now navigators may operate safely on from 1 to 2 feet lower stages than formerly.

The annual tonnage of the river above slack-water improvements which are now in course of construction is about 400,000, extending over 230 miles from Tarentum, Pa., to Olean, N. Y.

As above stated, a complete survey of the river basin is not available; therefore, no complete estimate can be made of the total possibilities of preventing floods and maintaining navigable stages during

low water. The storage capacity that can now be computed is sufficient to entirely conserve the run-off from an area of 1,774 square miles, or 15.6 per cent of the total drainage area. The locations of these storage reservoirs, together with facts concerning them, are set forth in the following table:

Selected reservoir sites in the Allegheny River Basin

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Conewango River, east of Jamestown, N. Y.	280	590	275	17,590	38	24,000
Chautauqua Lake	190	(a)	27	1,740	.....	13,400
French Creek, Marvin, N. Y.	86	148	86	5,677	75	4,700
Dodge Creek, Portville, N. Y.	46	92	46	2,990	100	1,860
Haskell Creek, Olean, N. Y.	30	60	30	1,950	70	1,320
Mahoning Creek, Mahoning, Pa.	370	636	370	22,100	251	5,300
Cowanshannock Creek, Valley County, Pa.	48	82	48	2,720	118	1,390
Buffalo Creek, S.W.N. Buffalo County, Pa.	80	138	80	5,120	149	2,260
Clarion River, Clarion, Pa.	990	1,700	436	23,850	210	6,920
Loyal Hanna, Saltsburg, Pa.	260	472	58	3,180	98	2,200
Crooked Creek, Burrell Co., Pa.	200	340	200	12,415	110	7,800
Twolick Creek, Homer, Pa.	68	116	52	2,860	122	1,300
Yellow Creek, Homer, Pa.	66	112	66	3,900	150	1,620

a Three feet on surface.

The highest run-off from the Allegheny basin, of which there is authentic record, occurred during the flood that began March 22, 1905, when the highest discharge was 272,000 second-feet. The total flowing past Pittsburg from both the Allegheny and the Monongahela was 317,000 second-feet, showing that, in this region at least, the Allegheny was the principal cause of the flood in the Ohio. This is not usually the case, however, the Monongahela being more often the principal offender.

MONONGAHELA BASIN

The drainage area of this river is 7,400 square miles in extent. Excellent topographic surveys covering the entire basin make it possible to determine with a fair degree of completion the storage facilities afforded by the basin. The character of the drainage area is somewhat similar to that of the Allegheny. The greatest contributor to the flood of March, 1907, was the Monongahela, and the relation of this basin to the Ohio will be discussed in subsequent pages.

The Monongahela is canalized from its mouth to Fairmont, W. Va., the slack-water system comprising 15 dams and 19 locks, the total cost of which to June 30, 1905, was $6,023,605. For the maintenance of these locks up to the same date the United States has paid $1,694,380. A slack-water system is now proposed for the Youghiogheny, consisting of 3 locks and dams at an estimated cost of $600,000.

Proper manipulation of the reservoirs that are shown to be available in the Monongahela basin would afford an increased stage above that of low water at three sections, namely, the Morgantown bridge, Brownsville, and McKeesport, as shown in the following tables:

SECTION BELOW MORGANTOWN BRIDGE

	Duration of stage (days).					
Increase of stage	1.1	1.1	1.1	4.0	1.1	4.0
Flow required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Reservoirs:						
Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One-half full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

SECTION AT BROWNSVILLE, PA.

Increase of stage	1.1	1.1	1.1	4.1	1.1	4.1
Flow required	730	1,730	1,070	4,670	1,570	4,730
Reservoirs:						
Full	[illegible]	730	410	270	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	310	[illegible]	[illegible]	[illegible]
One-half full	670	305	205	[illegible]	[illegible]	70

SECTION BELOW MCKEESPORT, PA.

Increase of stage	1.1	1.1	1.1	4.0	1.1	4.0
Flow required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Reservoirs:						
Full	[illegible]	[illegible]	410	[illegible]	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	310	[illegible]	[illegible]	[illegible]
One-half full	730	225	205	[illegible]	100	70

The above tables show that intelligent manipulation of available storage on the Monongahela would provide ample depth for navigation of the river during low-water seasons. It is possible that the money expended for canalization might have been spent to a better purpose in the hills. Now, that the dams are erected, the proper course is to erect the reservoirs and produce profitable power in these dams, so that the system will be self-supporting.

The available storage in the Monongahela basin will absolutely conserve [illegible] square miles, or about [illegible] per cent of the entire basin, the result of which would be to diminish the heights of the floods along the lower reaches of the Monongahela by at least 50 per cent. Facts concerning the available storage facilities in the basin are set forth in the following table:

Selected reservoir sites in the Monongahela River basin.

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir [illegible] cubic feet.	Height of dam.	Area of flowline.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Dunkard Creek, Lake County, V. Va.	[illegible]	270	[illegible]	[illegible]	[illegible]	[illegible]
Buffalo Creek, Mannington, V. Va.	40	70	40	[illegible]	[illegible]	[illegible]
Buffalo Creek, Mannington, V. Va.	40	70	40	[illegible]	[illegible]	[illegible]
Sandy Creek, Grafton, V. Va.	40	40	40	[illegible]	[illegible]	[illegible]
Tygart Creek, Beverly, V. Va.	40	40	40	[illegible]	[illegible]	[illegible]

Selected reservoir sites in the Monongahela River basin—Continued

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Elk Creek, Clarksburg, W. Va.	100	170	100	5,900	92	4,500
West Fork River, Clarksburg, W. Va.	380	640	380	24,700	109	15,900
Buckhannon River, Buckhannon, W. Va.	310	530	310	18,800	77	13,200
Middle Fork, Tygart, Barbour County, W. Va.	140	230	140	8,100	107	4,300
Cheat River, Tucker County, W. Va.	820	1,400	440	23,800	200	6,600
Tygart River, Berkeley County, W. Va.	330	560	330	19,100	142	10,000
Tenmile Creek, Millsboro, Pa.	310	527	283	15,200	180	6,500
Whitly Creek, Mapletown, Pa.	66	112	69	3,600	140	2,240
Youghiogheny River, Friendsville, Md.	270	690	255	20,270	240	4,220
Deep Creek, Garrett County, Md.	55	136	55	4,603	83	3,200
Cherry Creek, Garrett County, Md.	55	136	55	4,912	64	3,930
Muddy Creek, Garrett County, Md.	13	32	13	1,065	70	1,100
Herrington Creek, Garrett County, Md.	13	32	11	900	60	760

If the above system of storage reservoirs were installed and power developed on the dams that have been erected on the Monongahela for canalization at an expense of over $6,000,000, the income from water-power rental, at an average of $20 per horsepower-year would be $887,000, or an equivalent of a 3 per cent income on an investment of $29,500,000. On the Youghiogheny alone, where it is proposed to install a slack-water system comprising three locks and dams, at an expense of $600,000, proper development of storage will insure the production of a minimum horsepower of 4,100, the value of which, reckoned on the exceedingly low price of $20 per horsepower-year, would produce a total income of $82,000, which represents an interest of 3 per cent on $2,700,000. This region is a great commercial and manufacturing center and power is in demand. Therefore, the estimate of $20 per horsepower-year is considerably less than that which might reasonably be expected.

KANAWHA RIVER

The basin of Kanawha River is 12,000 square miles in extent. The river itself is subject to wide fluctuation in stage and the floods are somewhat severe. There have been identified in the Kanawha basin reservoir sites of total capacity sufficient to absolutely conserve the run-off from 6,080 square miles, which is 50 per cent of the entire drainage area. The effect of this conservation on floods will be to reduce their heights by more than an equivalent proportion.

The effect of such a system of reservoirs on navigation in the Kanawha is important. The present project for improvement of navigation provides for the maintenance of a 6-foot depth along the lower 96 miles of the river. For the first 79 miles this is accomplished during low water by 8 movable dams and for the remainder

of the distance by 2 fixed dams. These dams have been erected at an expenditure of $4,114,518, and $667,000 have been expended for care and operation, this expense increasing annually. Proper manipulation of storage from these reservoirs would produce along the present canalized portion, without the aid of the movable dams, increased depths, as shown in the following table:

SECTION ABOVE LOCK NO. 1

	Duration of stage (days).						
Increase of stage.	1.1	2.1	3.1	4.1	5.1	6.1	7.1
Flow required.	1,270	1,820	2,160	4,160	12,400	14,400	18,200
Reservoirs:							
Full.	1,400	850	714	247	254	197	160
Three-fourths full.	1,400	140	300	200	102	140	120
One-half full.	120	625	257	174	120	10	40

SECTION BELOW ELK RIVER

About 2½ miles above Lock No. 9

Increase of stage.	1.1	2.1	3.1	4.1	5.1	6.1	7.1
Flow required.	700	1,020	2,150	2,710	3,200	4,400	6,000
Reservoirs:							
Full.	1,70	700	1,100	700	300	400	285
Three-fourths full.	1,100	1,040	420	300	400	140	270
One-half full.	1,095	495	350	295	300	220	192

From the above table it will be seen that the storage proposed on the upper drainage area of Kanawha River is sufficient to produce in the steeper section an additional 7-foot stage for a period of one hundred and sixty days with reservoirs full, or one hundred and twenty days with the reservoirs three-fourths full, while at the section below the mouth of Elk River the effect is far more marked. The additional discharge of 4,000 cubic feet per second raises the stage 7 feet. The possibilities along this portion of the river for maintenance of navigable stage by the release of stored waters are so great that it appears that the installation of the slack-water system was unnecessary throughout the portion in which movable dams have been installed.

Kanawha River basin is capable of great development for water power. The total minimum indicated power along the river and its tributaries, resulting from a recent survey, is shown as 335,000 horsepower, which, with the installation of the proposed storage system, would be enormously increased. For example, if this stored water were equally distributed over an entire twelve months there would be available along the main stem of the Kanawha and New rivers an indicated horsepower of 445,000, in addition to that now available during the low-water season, the value of which, based on a rental of $20 per horsepower-year, would be $9,000,000 annually, equivalent to a 3 per cent income on $300,000,000.

The location of these proposed reservoirs and facts concerning them are set forth in the following table:

Selected reservoir sites in the Kanawah River basin

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Greenbrier River, Pocahontas County, W. Va.	320	460	320	16,300	177	4,700
Elk River, Clay County, W. Va.	940	1,350	940	49,900	190	15,700
Greenbrier River, Lewisburg, W. Va.	680	980	680	32,900	164	11,600
Meadow River, Greenbrier County, W. Va.	180	250	180	8,000	80	7,000
Muddlety Creek, Nicholas County W. Va.	60	90	60	3,400	74	2,600
Blue Creek, Kanawha County, W. Va.	60	90	60	3,300	97	2,300
Gauley River, Fayette County, W. Va.	1,290	1,860	780	35,900	250	7,500
New River, above mouth of Greenbrier River	3,600	5,750	390	20,300	135	8,000
Walker Creek, Giles County, Va.	310	620	100	6,550	110	3,000
New River, Radford, Va.	1,740	3,500	920	59,400	125	23,000
Reed Creek, Wythe County, Va.	250	510	100	6,400	100	4,500
Big Reed Island Creek, Pulaski County, Va.	390	770	60	4,000	100	2,800
Cripple Creek, Wythe County, Va.	180	370	40	2,900	100	2,000
New River, Carroll County, Va.	1,290	2,600	300	19,400	200	6,200
Eighteen-Mile Creek, Putnam County, W. Va.	60	80	60	4,000	63	2,300
Thirteen-Mile Creek, Mason County, W. Va.	80	100	80	3,400	61	2,000
Pocotaligo River, Putnam County, W. Va.	230	300	110	4,700	65	3,900
Coal River, Kanawha County, W. Va.	890	1,250	890	40,580	128	20,800

LITTLE KANAWHA AND BIG SANDY RIVERS

These two rivers drain important areas in Kentucky and West Virginia. The Little Kanawha has a drainage area of 2,300 square miles, and navigation is quite important. There had been expended up to June 30, 1905, the sum of $214,387. Flat-boat navigation extends from the mouth up to Burnsville, W. Va., a distance of 120 miles. The river is not extremely valuable as a power stream, although there are some sites that might be utilized to advantage if the storage facilities on the drainage area were developed. Reservoir sites have been identified that will absolutely conserve the annual run-off from 960 square miles, which is 42 per cent of the entire drainage area. This would have a greater proportional effect upon the height of the floods in the Little Kanawha itself, while its effects on floods and navigation in the Ohio will be considered in subsequent pages.

The Big Sandy is an important river basin by reason of its enormous coal deposits. The drainage area is 3,950 square miles in extent, and the character of the basin is such that it is subject to extreme fluctuations in river stage, and floods are severe. Up to June 30, 1905, the Government had expended on the main stream $955,000, while on the two principal forks it had expended over $60,000. The project for improvement requires the construction of 10 locks and dams on Levisa Fork, between Louisa and Pikeville, Ky., and 8 locks and dams on Tug Fork, between Louisa and the mouth of Pond Creek.

Three locks and dams will also be required on the main river between Louisa and Catlettsburg. The estimated cost of this improvement is $4,725,000.

Sites for reservoirs in the drainage basin are numerous, but for the purpose of abating Ohio River floods and assisting low-water navigation they can all be combined in two reservoirs which would store the entire mean annual flow from 3,540 square miles. This would involve the construction of dams on both Levisa and Tug forks, a short distance above their confluence, and the flooding of the country for long distances above. Especially on Levisa Fork would the flooding be considered somewhat serious at the present time, for there is involved the submergence of Paintsville, Pikesville, and Prestonburg, towns of about 500 inhabitants each, all three being county seats. While the small size of these towns simplifies the problem so far as practical reservoir construction is concerned and the damages involved would not be great in proportion to the total cost of the reservoir, it would involve considerable disturbance in the political affairs of these three counties. While it is true that the difficulties are more apparent than real, the submergence of these towns could be effected only by overcoming considerable local opposition. The practicability of the installation of these reservoirs, from an engineering standpoint, and their economic importance to the Ohio River is such that their installation is recommended in spite of the submergence above discussed. Of course, it is true that a portion of the storage involved in these two reservoirs could be effected by the construction of several smaller ones that would not interfere with the towns in question. An alternative plan would be to postpone the construction of these reservoirs until all the other developments have been effected, by which time the practicability of the whole scheme and the enormous advantages arising from it would overcome all local opposition and the force of public opinion would carry these reservoirs through.

The locations of the reservoirs on Little Kanawha and Big Sandy rivers, together with facts relating thereto, are shown in the following table:

Selected reservoir sites in the Little Kanawha and Big Sandy River basins

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Indian Creek, Murphy Co., W. Va.	30	40	10	420	100	260
South Fork, Hughes River, Murphy County, W. Va	140	200	120	5,600	105	2,610
Little Kanawha River, Gilmer County, W. Va	680	980	680	35,210	97	24,120
Right Fork, Steer Creek, Gilmer County, W. Va	150	220	150	8,060	96	4,970
Levisa Fork, Big Sandy River, Lawrence County, Ky	2,100	2,940	2,100	104,722	86	66,400
Tug Fork, Big Sandy River, Wayne County, Ky	1,440	2,020	1,440	72,860	150	41,300

KENTUCKY, LICKING, SCIOTO, AND GREAT MIAMI RIVER BASINS

Complete surveys are not available over any of these basins and therefore a complete estimate of the possibilities arising from conservation on these areas can not be stated here. Were more information available a far greater reservoir capacity would be shown, and consequently the effect on Ohio River would be greater than is indicated in this discussion. Facts concerning these reservoir sites are set forth in the following table:

Selected reservoir sites in the Kentucky, Licking, Scioto, and Great Miami river basins

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Kentucky River, Beattyville, Ky	1,870	2,580	1,810	79,000	120	38,200
South Fork Kentucky River, Boonville, Ky	470	648	470	22,100	90	16,000
Licking River, West Liberty, Ky.	600	750	590	23,300	110	12,600
Olentangy River, southeastern Marion County, Ohio	335	335	84	2,690	55	2,760
Scioto River, Delaware, Ohio	770	770	116	3,700	58	4,400
Alum Creek, Westerville, Ohio	162	162	82	2,600	60	3,160
Miami River, headwaters, Ohio	.....	.....	95	3,000	.....	.....

CUMBERLAND RIVER

Conditions with reference to surveys in the Cumberland River basin are similar to those already stated for the Kentucky and other streams. A complete statement of the possibilities of conservation can not be given here. In the following table are set forth the storage facilities identified on those portions that have been surveyed:

Selected reservoir sites in the Cumberland River basin

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Cumberland River, Williamsburg, Ky	950	1,190	950	41,600	82	33,710
Cumberland River, Pineville, Ky.	670	840	670	26,790	115	14,890
Collins River, Minnville, Tenn.	650	980	300	14,540	100	9,980
Caney Fork River, east of Smithville, Tenn	1,180	1,770	460	22,110	150	6,520
Rockcastle River, Rockcastle County, Ky	640	800	632	25,000	140	15,500

TENNESSEE RIVER

Tennessee River has a drainage area of 39,000 square miles. The character of its basin varies from the mountainous portions in the Appalachian region to the flatter country extending across the western end of Kentucky. It is a river subject to great amplitude in river stage due to descending floods which have in the past been extremely destructive to property and especially to agricultural land.

SMALLER TRIBUTARIES OF OHIO RIVER

Topographic surveys are available along some of the smaller tributaries of the Ohio that show good facilities for conservation. As units, they do not appear of sufficient importance to treat separately with reference to floods, navigation and water power, and therefore the facts are included in the following table. It will be observed that their united capacity is considerable and will have highly important effects on the main river. They will conserve the annual flow from 3,933 square miles.

Selected reservoir sites in smaller tributaries of Ohio River

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Mosquito River, northeast of Warren, Ohio	87	98	87	3,260	30	7,000
Raccoon Creek, Below Beaver, Pa	160	272	160	9,500	160	2,400
Little Beaver River, Columbiana County, Ohio	530	900	517	27,800	240	7,440
Yellow Creek, Hammondsville, Ohio	176	299	158	8,480	150	3,720
Buffalo Creek, Brooke County, W. Va	136	231	136	7,690	150	1,880
Wheeling Creek, Wheeling, W. Va.	220	374	218	11,700	170	3,740
Guyandotte River, Lincoln County, Ky	1,290	1,800	1,290	58,460	125	32,000
Mud River, Cabell County, Ky	270	378	136	6,120	100	4,200
Middle Island Creek, St. Mary's W. Va	480	860	470	25,520	119	14,000
Little Muskingum River, Lawrence County, Ohio	276	414	276	14,650	117	8,100
East Fork Duck Creek, Lower Salem, Ohio	108	162	108	5,460	85	4,300
Fish Creek, southeastern Marshall County, W. Va	226	384	226	13,400	181	4,000
Captina Creek, southeast of Belmont County, Ohio	160	272	151	8,225	155	2,760

Facts concerning reservoir facilities of the various tributaries of the Ohio have now been given. It should be noted that the information concerning some of the tributaries is not complete and that some of the large tributaries are not represented. The greater part of the area covered lies to the south of the Ohio, while surveys of the northern tributaries are somewhat sparse. For this reason it has been necessary to omit from consideration large affluents of the Ohio, like the Wabash, Green, and Muskingum, while the Scioto and Miami are practically without representation. The consideration of floods on the Ohio will proceed without them, and if it can be shown that the incomplete reservoir system heretofore presented will abate floods in the Ohio the efficiency of the system and the integrity of the principle will have been demonstrated.

FLOODS ON THE OHIO

All floods on the Ohio do not have a common origin. At times they arise in the upper part of the river and by the time they have reached the lower portion have become so flattened out that they cause no damage or apprehension. Again, floods sometimes visit

SECTION AT KNOXVILLE

	Duration of stage (days).									
Increase of stage	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Flow required	970	3,220	6,380	9,930	13,700	17,670	21,840	26,210	30,780	35,300
Reservoirs:										
Full	4,250	1,280	647	416	300	233	189	157	134	117
Three-fourths full	3,187	960	485	312	225	174	142	117	100	87
One-half full	2,125	640	323	208	150	116	95	78	67	58

SECTION AT CHATTANOOGA

Increase of stage	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Flow required	2,780	6,540	11,040	16,000	25,580	27,870	34,470	41,070	47,670	54,270
Reservoirs:										
Full	2,890	1,230	728	502	314	288	233	196	168	148
Three-fourths full	2,167	922	546	376	160	216	174	147	126	111
One-half full	1,445	615	364	351	107	144	116	98	84	74

SECTION BELOW RIVERTON

Increase of stage	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0
Flow required	1,440	4,200	7,600	11,500	15,900	20,800	26,000	31,600	37,500	43,000
Reservoirs:										
Full	5,600	1,900	1,060	700	500	390	310	250	210	180
Three-fourths full	4,200	1,430	790	520	380	290	230	190	160	138
One-half full	2,800	950	530	350	250	195	155	125	105	90

The facilities for reservoir construction in the basin are set forth in the following table:

Selected reservoir sites in the Tennessee River Basin

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Clinch River, Scott County, Va	780	1,080	600	30,400	180	10,000
Nolichucky River, Greenville, Tenn	940	1,500	270	14,700	100	10,200
Clinch River, Sneedville, Tenn	500	770	390	18,500	100	8,500
Powell River, Jonesville, Va	570	790	380	17,100	100	12,000
Holston River, northeast of Knoxville, Tenn	3,400	5,300	3,300	163,500	160	49,000
French Broad River, east of Knoxville, Tenn	4,050	6,300	4,000	199,600	200	70,000
Little River, south of Knoxville, Tenn	290	450	290	17,400	94	12,100
Little Tennessee River, Loudon County, Tenn	2,520	7,000	860	78,000	100	54,400
Little Tennessee River, Swain County, Tenn	380	1,050	80	7,340	100	5,120
Clinch River, Roane County, Tenn	2,110	2,900	600	26,500	60	30,000
Cheoah River, Graham County, N. C	180	500	75	6,700	150	2,840
Hiwassee River, Cherokee County, N. C	550	1,450	380	32,400	200	11,080
Nottely River, Union County, Ga.	240	410	20	1,000	40	1,680
Toccoa River, Fannin County, Ga	240	510	60	4,130	100	2,880
Hiwassee River, Hiwassee, Ga	100	260	40	2,240	100	1,600
Tennessee River, Rabun County, Ga	50	220	20	2,720	50	3,800
Hiwassee River, near mouth, Tenn	2,040	4,300	1,130	77,500	70	70,000
West Chickamauga Creek, Walker County, Ga	80	160	80	5,260	60	6,300
South Chickamauga Creek, Catoosa County, Ga	110	220	100	6,330	60	7,400
Sequatchie River, Sequatchie County, Tenn	330	660	60	4,000	50	5,500

SMALLER TRIBUTARIES OF OHIO RIVER

Topographic surveys are available along some of the smaller tributaries of the Ohio that show good facilities for conservation. As units, they do not appear of sufficient importance to treat separately with reference to floods, navigation and water power, and therefore the facts are included in the following table. It will be observed that their united capacity is considerable and will have highly important effects on the main river. They will conserve the annual flow from 3,[illegible] square miles.

Selected reservoir sites on smaller tributaries of Ohio River

Stream and location.	Contributing area above reservoir.	Mean annual flow from contributing area.	Capacity of reservoir in square miles of contributing area.	Capacity of reservoir in ...,000,000 cubic feet.	Height of dam.	Area of flow line.
	Sq. miles	*Second-feet.*			*Feet.*	*Acres.*
Muskingum River, tributary of Warren, Ohio	6	19	6	1,[illegible]	[illegible]	7,[illegible]
Raccoon Creek, below Beaver, Pa.	19	22	19	1,[illegible]	[illegible]	2,[illegible]
Little Beaver River, Columbiana County, Ohio	28	99	27	27,[illegible]	[illegible]	7,[illegible]
Yellow Creek, Bannonsville, Ohio	27	28	15	1,[illegible]	[illegible]	1,[illegible]
Buffalo Creek, Brooke County, W. Va.	18	21	18	7,[illegible]	[illegible]	1,[illegible]
Wheeling Creek, Wheeling, W. Va.	28	37	28	[illegible],700	270	1,[illegible]
Guyandotte River, [illegible] County, Ky.	39	1,[illegible]	1,[illegible]	5,[illegible]	[illegible]	2,[illegible]
Big River, Carroll County, Ky.	27	37	18	1,[illegible]	[illegible]	4,[illegible]
Middle Island Creek, St. Marys, W. Va.	46	60	47	2,[illegible]	[illegible]	5,[illegible]
Little Muskingum River, Lawrence County, Ohio	27	46	27	4,[illegible]	[illegible]	1,[illegible]
East Fork Dunkard Creek, Greene, Ohio	19	16	19	1,[illegible]	[illegible]	1,[illegible]
Fish Creek, southeastern Marshall County, W. Va.	28	36	28	2,[illegible]	[illegible]	1,[illegible]
Captina Creek, southeast of Belmont County, Ohio	19	22	18	1,[illegible]	[illegible]	2,[illegible]

Facts concerning reservoir facilities of the various tributaries of the Ohio have now been given. It should be noted that the information concerning some of the tributaries is not complete and that some of the large tributaries are not represented. The greater part of the area covered lies to the south of the Ohio, while surveys of the northern tributaries are somewhat sparse. For this reason it has been necessary to omit from consideration large affluents of the Ohio, like the Wabash, Green, and Muskingum, while the Scioto and Miami are practically without representation. The consideration of floods on the Ohio will proceed without them, and if it can be shown that the incomplete reservoir system hereafter presented will abate floods in the Ohio, the efficiency of the system and the integrity of the principle will have been demonstrated.

FLOODS ON THE OHIO

All floods on the Ohio do not have a common origin. At times they arise in the upper part of the river and by the time they have reached the lower portion have become so flattened out that they cause no damage or apprehension. Again, floods sometimes visit

low water. The storage capacity that can now be computed is sufficient to entirely conserve the run-off from an area of 1,774 square miles, or 15.6 per cent of the total drainage area. The locations of these storage reservoirs, together with facts concerning them, are set forth in the following table:

Selected reservoir sites in the Allegheny River Basin

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir (1,000,000 cubic feet).	Height of dam.	Area of flow line
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
Conewango River, east of Jamestown, N. Y.	280	560	275	17,590	38	24,000
Chautauqua Lake	190	(a)	27	1,740	.....	13,400
French Creek, Marvin, N. Y.	86	148	86	5,677	75	4,700
Dodge Creek, Portville, N. Y.	46	92	46	2,900	100	1,860
Haskell Creek, Olean, N. Y.	30	60	30	1,950	70	1,320
Mahoning Creek, Mahoning, Pa.	370	636	370	22,100	251	5,300
Cowanshannock Creek, Valley County, Pa.	48	82	48	2,720	118	1,390
Buffalo Creek, S.W.N. Buffalo County, Pa.	80	138	80	5,120	149	2,260
Clarion River, Clarion, Pa.	990	1,700	436	23,850	210	6,920
Loyal Hanna, Saltsburg, Pa.	260	472	58	3,180	98	2,200
Crooked Creek, Burrell Co., Pa.	200	340	200	12,415	110	7,800
Twolick Creek, Homer, Pa.	68	116	52	2,860	122	1,300
Yellow Creek, Homer, Pa.	66	112	66	3,900	150	1,620

a Three feet on surface.

The highest run-off from the Allegheny basin, of which there is authentic record, occurred during the flood that began March 22, 1905, when the highest discharge was 272,000 second-feet. The total flowing past Pittsburg from both the Allegheny and the Monongahela was 317,000 second-feet, showing that, in this region at least, the Allegheny was the principal cause of the flood in the Ohio. This is not usually the case, however, the Monongahela being more often the principal offender.

MONONGAHELA BASIN

The drainage area of this river is 7,400 square miles in extent. Excellent topographic surveys covering the entire basin make it possible to determine with a fair degree of completion the storage facilities afforded by the basin. The character of the drainage area is somewhat similar to that of the Allegheny. The greatest contributor to the flood of March, 1907, was the Monongahela, and the relation of this basin to the Ohio will be discussed in subsequent pages.

The Monongahela is canalized from its mouth to Fairmont, W. Va., the slack-water system comprising 15 dams and 19 locks, the total cost of which to June 30, 1905, was $6,023,605. For the maintenance of these locks up to the same date the United States has paid $1,694,380. A slack-water system is now proposed for the Youghiogheny, consisting of 3 locks and dams at an estimated cost of $600,000.

Proper manipulation of the reservoirs that are shown to be available in the Monongahela basin would afford an increased stage above that of low water at three sections, namely, the Morgantown bridge, Brownsville, and McKeesport, as shown in the following tables:

[illegible] BELOW MORGANTOWN BRIDGE

	Increase of stage (feet)					
Increase of stage	1.1	2.1	3.1	4.1	5.1	6.1
Flow required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lengthen						
Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One-half full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] AT BROWNSVILLE, PA.

Increase of stage	1.1	2.1	3.1	4.1	5.1	6.1
Flow required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lengthen						
Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One-half full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

[illegible] AT MCKEESPORT, PA.

Increase of stage	1.1	2.1	3.1	4.1	5.1	6.1
Flow required	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Lengthen						
Full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Three-quarters full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
One-half full	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

The above tables show that intelligent manipulation of available storage in the Monongahela would provide ample depth for navigation of the river during low-water seasons. It is possible that the money expended for canalization might have been spent to a better purpose in the [illegible]. Now, that the dams are erected, the proper course is to store the reservoirs and produce profitable power in some [illegible] so that the system will be self-supporting.

The available storage in the Monongahela basin will absolutely [illegible] [illegible] square miles, or about 35 per cent of the entire basin. The result of which would be to diminish the height of the floods along the lower reaches of the Monongahela by at least 50 per cent. Facts concerning the available storage facilities in the basin are set forth in the following table:

[illegible] reservoir sites on the Monongahela River basin.

Stream and location.	Catchment area above reservoir.	Mean annual flow from catchment area.	Capacity of reservoir in square miles of catchment area.	Capacity of reservoir [illegible] cubic feet.	Height of dam.	Area of lake line.
	Sq. miles.	*Second-feet.*			*Feet.*	*Acres.*
[illegible] Creek, Cass County, W. Va.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Buffalo Creek, Mannington, W. Va.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Bowers Creek, Mannington, W. Va.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Creek, [illegible], W. Va.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
[illegible] Creek, [illegible], W. Va.	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

made by our system at this point, then, can the scheme be regarded with confidence.

The danger line at Point Pleasant is 39 feet on the gauge, equivalent to 332,000 cubic feet per second. It will be significant to contrast this with the danger-line capacity at Parkersburg, where the flow at the danger line is 336,000 cubic feet per second, although the drainage area is less by 14,300 square miles than at Point Pleasant. The effects of the floods of January and March, 1907, and the effects that the proposed storage system would have, had it been installed at the time, are set forth in the following table:

Estimated effect of storage on floods of January and March, 1907, at Point Pleasant, W. Va.—Danger line, 39 feet, equivalent to a flow of 332,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 15	36.8	305,000	219,000	29.8
16	43.2	390,000	280,000	35.0
17	46.0	430,000	309,000	33.2
18	50.1	485,000	349,000	40.2
19	52.0	515,000	370,000	41.7
20	51.9	510,000	367,000	41.5
21	50.5	490,000	352,000	40.5
22	48.7	465,000	334,000	39.2
23	46.0	425,000	305,000	36.9
24	42.3	375,000	270,000	34.0
25	34.5	275,000	198,000	29.8

FLOOD OF MARCH

Mar. 14	34.3	270,000	207,000	29.0
15	46.4	430,000	325,000	36.5
16	52.4	520,000	393,000	43.5
17	54.7	550,000	415,000	45.2
18	54.8	555,000	419,000	45.5
19	52.7	525,000	396,000	43.9
20	48.7	465,000	351,000	40.5
21	44.9	410,000	309,000	37.1
22	42.7	380,000	287,000	35.6
23	40.5	350,000	264,000	33.6
24	36.8	305,000	230,000	30.6

The above figures show that the danger line would have been submerged in both floods with the storage system here considered; in the January flood it would have been submerged by 2.7 feet, and in that of March by 6.5 feet. The result is eminently satisfactory; by making allowances for unsurveyed areas and check of torrential flow noted in previous pages, it will be appreciated that no damage would have arisen at Point Pleasant by reason of either flood had the storage system been installed.

At Huntington, W. Va.—Above Huntington, W. Va., the Ohio River system is 58,600 square miles in extent, of which 15,500, or 26 per cent, is here included in conservancy. Between Point Pleasant and Huntington the principal tributary of the Ohio is the Guyandotte, on which there have been identified reservoirs sufficient to conserve an area of 1,426 square miles.

The danger line at Huntington is 50 feet, equivalent to a discharge of 512,000 cubic feet per second. Examination of the following table will show that the reservoir system herein considered would, without allowances being made for any feature, have reduced the floods of January and March, 1907, at Huntington below the danger line, making the maximum gauge height 46.2 or 1.8 feet below said line.

Estimated effect of storage in floods of January and March, 1907, at Huntington, W. Va.—Danger line 50 feet, equivalent to a flow of 512,000 second-feet.

Day	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
FLOOD OF JANUARY				
Jan. 6	48.4	591,000	570,000	48.1
7	51.1	665,000	610,000	48.2
8	54.1	695,000	647,000	48.3
9	57.[illegible]	725,000	675,000	48.7
10	57.4	725,000	690,000	48.1
11	56.1	720,000	672,000	48.4
12	54.1	695,000	655,000	48.1
13	52.1	660,000	625,000	48.0
14	49.[illegible]	615,000	590,000	46.3
FLOOD OF MARCH				
Mar. 3	49.4	611,000	587,000	48.4
4	50.2	630,000	575,000	48.7
5	51.1	640,000	605,000	47.3
6	50.4	645,000	607,000	48.1
7	51.2	650,000	602,000	47.4
8	50.1	630,000	587,000	48.0
9	50.1	630,000	585,000	48.0
10	49.[illegible]	615,000	585,000	46.3

At Catlettsburg, Ky.—Catlettsburg is 5 miles below Huntington; above the former there is a drainage area of 30,300 square miles, of which the present figures provide absolute conservation for 19,000 square miles. The Big Sandy River joins the Ohio at Catlettsburg. It has a drainage area of 1,960 square miles, of which there are facilities in the drainage area for the conservation of about 90 per cent, or 1,764 square miles. The records show that the contribution made by the Big Sandy to the floods of 1907 was 5 and 4 second-feet per square mile, respectively, or about the same as those of neighboring drainage areas. Therefore there is no adjustment to be made in the method of determining the effect of reservoirs by proportionate run-off. The following table gives a record of the floods of January and March, 1907, and the estimated effect of the proposed reservoir system. It will be seen that in neither case would the danger line have been reached, and this on only partial conservation and with no allowance for the checking of torrential run-off.

Estimated effect of storage on floods of January and March, 1907, at Catlettsburg, Ky.—Danger line 50 feet, equivalent to a flow of 428,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 16	47.8	400,000	275,000	38.0
17	52.4	460,000	317,000	41.4
18	55.4	500,000	345,000	43.6
19	59.0	550,000	379,000	46.3
20	59.9	560,000	386,000	46.8
21	58.4	540,000	372,000	45.7
22	56.4	515,000	355,000	44.4
23	53.0	470,000	324,000	42.0
24	50.6	435,000	300,000	40.0
25	45.0	365,000	252,000	36.0

FLOOD OF MARCH

Mar. 15	49.0	415,000	303,000	40.3
16	57.2	525,000	384,000	46.6
17	59.8	560,000	410,000	48.5
18	60.4	570,000	417,000	49.1
19	59.6	560,000	410,000	48.5
20	56.4	515,000	377,000	46.0
21	52.3	460,000	336,000	42.9
22	49.0	415,000	303,000	40.3

At Portsmouth, Ohio.—Scioto River, which has a drainage area of 6,400 square miles, enters the Ohio at Portsmouth. The total drainage area of the Ohio above Portsmouth is 66,300 square miles, of which 19,519, or about 30 per cent, is here included in conservancy. Full reservoirs in the Scioto basin would probably increase this proportion, but the present estimate includes only 441 miles. Portsmouth has suffered frequently from floods, and especially during the floods of January and March, 1907. The progress of the flood at Portsmouth during the high stages and the computed effect of the storage system are given in the following table. It will be seen that there would have been complete protection in both cases.

Estimated effects of storage on floods of January and March, 1907, at Portsmouth, Ohio.—Danger line 50 feet, equivalent to a flow of 407,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 16	48.6	390,000	270,000	38.4
17	53.4	450,000	311,000	42.1
18	56.3	485,000	335,000	44.1
19	59.3	525,000	363,000	46.4
20	60.9	545,000	377,000	47.5
21	60.7	540,000	373,000	47.2
22	59.2	525,000	363,000	46.4
23	57.5	500,000	346,000	45.0
24	54.7	465,000	321,000	43.0
25	50.0	407,000	281,000	39.6

Estimated effects of storage on floods of January and March, 1907, at Portsmouth, Ohio—Danger line 51 feet, equivalent to a flow of 417,000 second-feet—Continued

FLOOD OF MARCH

Day	Effect without conservation.		Permanent effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Mar. 1	[illegible]	[illegible]	[illegible]	[illegible]
2	[illegible]	[illegible]	[illegible]	[illegible]
3	[illegible]	[illegible]	[illegible]	[illegible]
4	[illegible]	[illegible]	[illegible]	[illegible]
5	[illegible]	[illegible]	[illegible]	[illegible]
6	[illegible]	[illegible]	[illegible]	[illegible]
7	[illegible]	[illegible]	[illegible]	[illegible]
8	[illegible]	[illegible]	[illegible]	[illegible]
9	[illegible]	[illegible]	[illegible]	[illegible]
10	[illegible]	[illegible]	[illegible]	[illegible]
11	[illegible]	[illegible]	[illegible]	[illegible]
12	[illegible]	[illegible]	[illegible]	[illegible]

At Maysville, Ky.—At Maysville, Ky., 53 miles below Portsmouth, Ohio, the effect would be similar to that at Portsmouth. During the flood of January the river was above the danger line of 50 feet for a period of nine days, the maximum being 61.3 feet, equivalent to a flow of 611,000 cubic feet per second. The reservoir system here considered would reduce this entirely below the danger line, making the maximum gauge height 49.4 feet, or 0.6 foot below the danger line. During the March flood the river was above the danger line eight days, the greatest submergence observed being 54.2 feet. The reservoir system would have reduced this to the danger line.

At Cincinnati, Ohio.—We come now to a consideration of floods at Cincinnati, Ohio, above which there is in the Ohio basin a drainage area of 75,000 square miles. Of this, the present report proposes to conserve 20,000 square miles, or 27 per cent of the whole. Licking River, a tributary basin, 3,870 square miles in extent, enters the Ohio from the south just above Cincinnati. The present report provides for the complete conservation of 500 square miles of the Licking basin. During the floods of 1907, the average run-off from Licking River was, for a period of ten days in each case, 21,000 cubic feet per second. The maximum was much higher than this. This unprecedented discharge in the top of an already gorged channel aggravated the conditions at Cincinnati. The Great Miami, too, was a factor. Although it enters the Ohio below Cincinnati, its enormous discharge of water during this flood had a backwater effect, and caused a higher stage at Cincinnati than would have occurred had the Miami been properly conserved.

The danger line at Cincinnati is 50 feet on the gauge, equivalent to a flow of 417,000 cubic feet per second. This is a new danger line, representing less channel capacity than the danger lines at Maysville and Portsmouth, in the river above. The effect of the floods on the river and the effect of storage according to the system proposed would be as follows:

Estimated effect of storage on floods of January and March, 1907, at Cincinnati, Ohio—Danger line 50 feet, equivalent to a flow of 415,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 15	47.2	375,000	272,000	39.7
16	51.1	430,000	311,000	42.6
17	55.7	500,000	362,000	46.2
18	59.4	560,000	405,000	49.2
19	61.9	595,000	435,000	50.9
20	64.1	630,000	456,000	52.6
21	65.1	645,000	466,000	53.3
22	64.6	640,000	463,000	53.1
23	63.2	615,000	445,000	51.9
24	61.2	585,000	423,000	50.5
25	58.1	540,000	391,000	48.2
26	54.0	475,000	344,000	44.9
27	48.0	390,000	282,000	40.5

FLOOD OF MARCH

Mar. 13	41.0	290,000	220,000	35.5
14	50.3	420,000	318,000	43.1
15	54.1	475,000	360,000	46.0
16	57.6	530,000	401,000	48.9
17	60.2	570,000	431,000	51.0
18	61.6	590,000	447,000	52.0
19	62.1	600,000	455,000	52.6
20	61.3	590,000	447,000	52.0
21	59.8	565,000	428,000	50.8
22	57.5	530,000	401,000	48.9
23	54.8	490,000	371,000	46.8
24	52.3	450,000	341,000	44.7
25	49.4	405,000	307,000	42.2

According to the computations in the above table, the reservoir system would have reduced the January flood to a total period above the danger line of five days and a maximum height of 53.3 feet, or 3.3 feet above the danger line, while the March flood would have been reduced somewhat more. Here, again, we are obliged to urge consideration of the factors that are left out of account in these computations. Utilization of all the conservation facilities on the drainage area above, and a proper accounting for the fact that it is the torrential flow that would be conserved, would in actual practice reduce the gauge height as shown by this proportional computation below the danger line. How far below, we do not know, but a fair-minded consideration of the matter will show that it would be well down to the point of safety.

At Madison, Ind.—The danger line at Madison is 46 feet, equivalent to a flow of 530,000 cubic feet per second in the channel. Between Cincinnati and Madison enter the Great Miami and Kentucky rivers. The former has a drainage area of 5,400 square miles, and it is necessary in this paper to consider it practically unconserved. The latter has a basin of 7,870 square miles extent, and partial surveys which do not permit of a thorough consideration of storage facilities reveal storage-reservoir sites of capacity sufficient to conserve 2,280 square miles. Madison, situated shortly below the entrance point of two great tributaries of the Ohio, subjects the conservation data included in this report to a severe test. The

Miami contributed a comparatively enormous amount of water in both floods, yet we have no means of determining how much might have been conserved. So far as these computations are concerned the river must run wild. The Kentucky also contributed a large amount of water, and, as above stated, we have for these computations the benefit of only partial surveys. Even under these unfavorable conditions, the following table shows entirely satisfactory indications. The January flood would have submerged the danger line 1.2 feet. A little more storage on the Kentucky and Miami rivers would have reduced this considerably below the line.

Estimated effect of storage on floods of January and March, 1907, at Madison, Ind.—Danger line 46 feet, equivalent to a flow of 530,000 second feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 17	45.9	530,000	392,000	36.5
18	49.1	590,000	436,000	41.2
19	51.6	640,000	474,000	43.2
20	54.2	700,000	518,000	45.4
21	56.1	740,000	547,000	47.0
22	56.7	750,000	555,000	47.2
23	56.3	740,000	547,000	47.0
24	55.1	720,000	432,000	46.3
25	53.0	670,000	495,000	44.3
26	50.2	620,000	459,000	42.5
27	46.0	530,000	392,000	36.5

FLOOD OF MARCH

Mar. 14	42.7	460,000	353,000	37.0
15	46.3	530,000	406,000	39.8
16	47.9	570,000	437,000	41.4
17	49.9	610,000	468,000	43.0
18	51.3	640,000	491,000	44.1
19	51.9	650,000	498,000	44.5
20	51.7	650,000	498,000	44.5
21	51.1	630,000	483,000	43.8
22	49.9	610,000	468,000	43.0
23	48.2	570,000	437,000	41.4
24	46.2	530,000	406,000	39.8
25	44.1	490,000	376,000	38.2

It is of interest to note that the tables relating to the upper end of the river show the March flood highest. Farther down they appear about equal, while the Madison table shows the greater severity of the January flood along this portion of the river.

At Louisville, Ky.—The observations concerning Madison apply to Louisville. The following table shows that, with conservation included in the computations in this report, the January flood would have submerged the danger line 2 feet. This amount is negligible in view of considerations previously described in similar cases.

Estimated effect of storage on floods of January and March, 1907, at Louisville, Ky.—Danger line 28 feet, equivalent to flow of 500,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 16	25.2	452,000	335,000	18.1
17	29.3	524,000	388,000	21.4
18	32.7	584,000	432,000	23.9
19	35.5	630,000	466,000	25.9
20	37.9	670,000	496,000	27.5
21	40.1	710,000	526,000	29.2
22	41.2	730,000	540,000	30.2
23	41.2	730,000	540,000	30.2
24	40.3	712,000	528,000	30.0
25	38.7	684,000	506,000	28.1
26	36.2	640,000	474,000	26.3
27	32.8	584,000	432,000	23.9
28	27.5	492,000	364,000	19.9

FLOOD OF MARCH

Mar. 14	22.7	410,000	315,000	16.8
15	28.6	510,000	392,000	21.5
16	31.3	560,000	430,000	23.9
17	33.0	590,000	453,000	25.2
18	34.3	610,000	468,000	26.1
19	35.6	630,000	484,000	26.9
20	35.9	640,000	491,000	27.3
21	35.5	630,000	484,000	26.9
22	34.6	610,000	468,000	26.1
23	33.1	590,000	453,000	25.2
24	31.1	550,000	422,000	23.3
25	28.6	510,000	391,000	21.5
26	25.8	460,000	353,000	19.2

Concerning the flatter portion of the Ohio River below Louisville, certain observations must be made with respect to the behavior of floods. It is well understood that the lower the slope of any river, the more pronounced will be the backwater effects of any tributary entering the river. Four great rivers and several smaller, though important, ones enter this flat portion of the stream below Louisville, namely, the Wabash, the Cumberland, the Green, and the Tennessee. When they pour their great floods into the lower Ohio their effect is to gorge the channel and back the water up to the foot of the falls at Louisville. In other words, if a flood comes out of the Wabash, Cumberland, Green, or Tennessee rivers into the lower Ohio the effect is almost as plainly marked for long distance above the point of confluence as it is below. Now, in estimating the effects of the reservoirs in the proposed system on the flood height at Evansville, Ind., for example, we can not take into account storage on the Tennessee, Cumberland, Green, and Wabash rivers, but must confine estimates to those on the tributaries above Evansville. Nevertheless it is readily appreciated that were these 4 great streams well conserved the effect would be to markedly reduce the floods in the Ohio River above their points of entrance. The estimates for Evansville and Mount Vernon are therefore given without taking account of such effects.

At Evansville, Ind.—The danger line at Evansville is 35 feet, equivalent to a flow of 390,000 cubic feet per second. This is exceedingly

low and does not provide for as great a flow as at any other point heretofore considered between Point Pleasant and Evansville. The progress of the floods of 1907 is as follows:

Estimated effects of storage in floods of January and March, 1907, at Evansville, Ind.—Danger zone 25 feet, equivalent to a flow of 500,000 second-feet

FLOOD OF JANUARY

Day	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 1	30.1	502,000	501,000	27.1
2	35.1	594,000	502,000	31.4
3	37.1	600,000	500,000	34.1
4	39.4	622,000	499,000	35.4
5	41.1	591,000	497,000	35.1
6	41.1	591,000	497,000	35.1
7	39.1	542,000	494,000	35.4
8	39.1	538,000	497,000	35.4
9	39.4	590,000	500,000	34.4
10	39.4	604,000	502,000	34.4
11	39.1	602,000	579,000	34.5
12	39.1	590,000	594,000	34.7
13	39.1	594,000	594,000	35.0
14	39.4	590,000	611,000	35.4
15	40.7	670,000	629,000	35.5
16	42.1	694,000	657,000	37.4
17	42.4	694,000	700,000	38.4
18	44.1	702,000	731,000	39.4
19	45.1	734,000	750,000	40.1
20	45.4	734,000	754,000	40.3
21	45.1	734,000	778,000	40.4
22	45.1	734,000	785,000	40.2
23	45.1	734,000	785,000	40.2
24	45.1	738,000	788,000	40.1
25	45.1	734,000	778,000	40.0
26	45.1	740,000	788,000	40.7
27	44.4	731,000	740,000	40.6
28	42.1	694,000	731,000	39.9
29	41.7	684,000	692,000	37.3
30	39.1	654,000	594,000	36.1
31	36.4	640,000	599,000	35.6
Feb. 1	32.4	559,000	574,000	34.5

FLOOD OF MARCH

Mar. 1	31.1	594,000	592,000	33.5
2	30.1	650,000	595,000	32.2
3	29.1	614,000	485,000	31.4
4	28.1	574,000	482,000	31.1
5	27.1	614,000	485,000	32.2
6	27.7	629,000	503,000	32.7
7	27.1	658,000	518,000	33.1
8	27.1	666,000	524,000	33.1
9	27.7	674,000	531,000	33.7
10	27.4	678,000	533,000	33.7
11	27.1	670,000	527,000	33.4
12	27.1	658,000	518,000	33.1
13	27.7	658,000	503,000	32.4
14	31.1	611,000	479,000	32.1
15	31.1	590,000	459,000	31.1
16	30.1	562,000	451,000	30.1
17	27.4	478,000	375,000	28.1
18	24.1	390,000	307,000	25.1

The conservation system on the Ohio tributaries entering above Evansville would not have retained either flood below the danger line. It is only fair, however, to call attention to the fact that the great Green River, which pours enormous floods into the Ohio at Evansville, has not been surveyed for reservoir sites and in the

above computations the benefits that would be derived from such storage have not been taken into account. Neither is the benefit of storage on the Cumberland, Tennessee, and Wabash rivers included in the estimate and had their back-water effects on the Ohio been decreased by conservation these two floods would probably never have reached the danger line at Evansville. Add to this the complete development of facilities on those other Ohio tributaries, like the Kentucky, Muskingum, Scioto, and Miami, and the flood problem at Evansville would be solved.

The conditions at Mount Vernon, Ind., are so similar to those at Evansville that they constitute merely a repetition. The river was above the danger line from January 5 to February 4, the highest excess being 13.5 feet. The storage on the river above would have reduced this to 6.3 feet above the danger line and, taking into account the factors above noted with reference to the Cumberland, Green, Tennessee, and Wabash rivers, it is reasonably certain that the river would never have reached the danger line at this point.

At Paducah, Ky.—The next point is Paducah, Ky., between which and Mount Vernon, Ind., enter the Wabash, Tennessee, and Cumberland rivers. We have not the benefit of surveys on the Wabash, and therefore must leave it out of consideration here. The Cumberland is also only partially surveyed, and, while there are shown to be available 2,380 square miles that may absolutely be conserved, it does by no means represent the highest development of conservation on the river. The Tennessee River has an area that may be conserved of 12,800 square miles. Therefore, we have in the station at Paducah, Ky., the effect of a completing conserved river in the Tennessee, partially conserved in the Cumberland and wild rivers in the Wabash and Green. The danger line at Paducah is 40 feet, equivalent to a flow of 830,000 cubic feet per second. The record of the floods of 1907, and the effect of such storage facilities as have been identified, are set forth in the following table:

Estimated effect of storage on floods of January and March, 1907, at Paducah, Ky.—Danger line 40 feet, equivalent to a flow of 830,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 21	39.7	820,000	664,000	35.3
22	41.0	867,000	702,000	36.4
23	42.3	923,000	748,000	37.7
24	43.4	970,000	786,000	38.7
25	44.3	1,008,000	819,000	39.6
26	45.0	1,036,000	839,000	40.2
27	45.6	1,062,000	860,000	40.7
28	45.7	1,065,000	864,000	40.9
29	45.6	1,062,000	860,000	40.7
30	45.3	1,048,000	849,000	40.5
31	44.8	1,028,000	833,000	40.1
Feb. 1	44.3	1,008,000	818,000	39.6
2	43.3	958,000	776,000	38.4
3	42.3	923,000	748,000	37.7
4	41.4	883,000	715,000	36.8
5	40.2	837,000	678,000	35.7
6	38.7	783,000	634,000	34.3

Estimated effect of storage on floods of January and March, 1907, at Paducah, Ky.—Danger line 40 feet, equivalent to a flow of 830,000 second-feet—Continued

FLOOD OF MARCH

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Mar. 20	39.8	820,000	554,000	35.0
21	40.7	856,000	683,000	35.9
22	41.4	885,000	705,000	36.6
23	41.9	905,000	721,000	37.0
24	42.2	918,000	732,000	37.3
25	42.3	923,000	736,000	37.4
26	42.2	918,000	732,000	37.3
27	42.0	910,000	725,000	37.1
28	41.5	890,000	710,000	36.7
29	40.7	856,000	682,000	35.9
30	39.7	820,000	654,000	35.0

No comment is necessary concerning the above figures.

At Cairo, Ill.—Finally, the effect of storage on these two floods at the mouth of the river is shown in the following table. It should be stated that these figures apply only when the Mississippi is in similar stage. A high flood on the Mississippi would produce a high stage along the lower portion of the Ohio, irrespective of flood conditions in the Ohio basin:

Estimated effect of storage on floods of January and March, 1907, at Cairo, Ill.—Danger line 45 feet, equivalent to a flow of 844,000 second-feet

FLOOD OF JANUARY

Day.	Effect without conservation.		Probable effect with conservation.	
	Gauge height.	Discharge.	Discharge.	Gauge height.
		Second-feet.	*Second-feet.*	
Jan. 21	44.8	834,000	676,000	40.8
22	46.4	905,000	735,000	42.3
23	47.8	967,000	784,000	43.5
24	48.8	1,010,000	819,000	44.4
25	49.6	1,050,000	852,000	45.1
26	50.1	1,074,000	873,000	45.6
27	50.3	1,082,000	879,000	45.8
28	50.3	1,082,000	879,000	45.8
29	50.0	1,068,000	868,000	45.5
30	49.6	1,050,000	852,000	45.1
31	49.2	1,030,000	835,000	44.8
Feb. 1	48.7	1,008,000	819,000	44.4
2	48.0	976,000	791,000	43.7
3	47.2	940,000	762,000	43.0
4	46.4	904,000	734,000	42.3
5	45.5	865,000	701,000	41.4
6	44.3	814,000	660,000	40.4

FLOOD OF MARCH

Mar. 21	44.9	840,000	670,000	40.7
22	45.5	865,000	690,000	41.3
23	45.9	883,000	704,000	41.6
24	46.1	893,000	712,000	41.8
25	46.1	893,000	712,000	41.8
26	46.0	887,000	707,000	41.7
27	45.8	880,000	701,000	41.5
28	45.5	865,000	690,000	41.3
29	45.1	848,000	676,000	40.9
30	44.5	822,000	655,000	40.4

CONCLUSIONS CONCERNING FLOOD ABATEMENT

In the foregoing pages the effect of conservation reservoirs in reducing the height of floods at numerous points along the Ohio, from Pittsburg to Cairo, has been reviewed. In making the computations of such effects certain legitimate allowances favorable to the conservation scheme have purposely been omitted. The test of the reservoirs has been made without giving them the advantage of these allowances in the computations. Occasional reference has been made to them in the text. It has been necessary to include rivers on which no information concerning conservation possibilities is obtainable and other rivers concerning which such information is not complete. Advantage has not been taken in the computations of the fact that the proposed reservoirs will conserve the torrential flow from each basin and leave unregulated the lower and more moderate portions. The figures have been based solely on proportionate areas, conserved and unconserved. All these disadvantages have been accepted freely and the test has been applied to the conditions arising in two floods along the Ohio, the greatest, with one exception, in a quarter of a century. What are the results?

It has been shown that the flood height in all cases would be either reduced below the danger line or would exceed the danger line by so small an amount that the use of any one of the allowances above mentioned would give complete abatement throughout the length of the river. It is impossible to draw any other conclusion from the data presented. The situation merits further consideration and examination as a part of the proposed government policy with reference to inland waters.

EFFECT OF STORAGE ON NAVIGATION

In the previous pages the effects of withholding a part of the flood waters from the Ohio River during flood seasons have been considered. We will now consider the effects of allowing this water to discharge into the river during the low-water seasons for the benefit of navigation. For this purpose, sections along the river have been selected, and the effect of the discharge of stored water under varying conditions has been computed. For the sake of brevity, no attempt will be made here to explain the interesting methods by which such results were arrived at, but the facts will be given in the following table. The first column of the table, entitled "Increase of stage, feet," means the amount that the stage would be increased above the low-water stage. The second column, entitled "Flow required," is merely a rating of the section showing what amount of water would be necessary to increase the stage at said section a stated number of feet. The last three columns in the table give the number of days that the flow from the reservoirs would maintain a stated increase of stage, the figures being based on full, three-fourths full, and half-full reservoirs. This latitude of reservoirs is included because it is conceivable that there are some years during which the reservoirs would not be completely filled, although it is hardly conceivable that there would be any year that they would not be considerably more than half full.

Assuming now that the low-water period is three months, or ninety days, long, the Pittsburg table shows that, with full reservoirs, an additional 4-foot stage could be maintained at Pittsburg for eighty-seven days, or practically the three months. Of course, in the actual manipulation of such reservoirs, they would not be called upon to deliver their water in this way. To maintain a certain stage in the river it would be necessary to start with only a small amount of water, because the ordinary stage of the river would depart from the required stage only gradually, and this amount of water necessary to maintain that stage would therefore increase to the maximum. The facts at command and the space in this report are not sufficient to permit the making of a critical estimate of this amount. Therefore the figures in the following table are given in their present form merely to show the great possibilities of assisting navigation with stored water. The final working out of the matter involves considerable labor as well as the minute study of the channel capacity from Pittsburg to Cairo.

Increase of stage of Ohio River and duration of same at gauge sections, resulting from release of stored water during the low-water season

PITTSBURG, PA.

Increase of stage.	Flow required.	Duration of stage, days: Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.1	1,[illegible]	[illegible]	[illegible]	[illegible]
3.1	11,[illegible]	[illegible]	[illegible]	[illegible]
4.1	21,[illegible]	[illegible]	[illegible]	[illegible]
5.1	32,[illegible]	[illegible]	[illegible]	[illegible]
6.1	38,[illegible]	[illegible]	[illegible]	[illegible]
7.1	47,[illegible]	[illegible]	[illegible]	[illegible]

BEAVER DAM, PA.

2.1	1,[illegible]	[illegible]	[illegible]	[illegible]
3.1	4,[illegible]	[illegible]	[illegible]	[illegible]
4.1	11,[illegible]	[illegible]	[illegible]	[illegible]
5.1	11,[illegible]	[illegible]	[illegible]	[illegible]
6.1	21,[illegible]	[illegible]	[illegible]	[illegible]
7.1	31,[illegible]	[illegible]	[illegible]	[illegible]

WHEELING, W. VA.

2.1	2,[illegible]	[illegible]	[illegible]	[illegible]
3.1	7,[illegible]	[illegible]	[illegible]	[illegible]
4.1	1,[illegible]	[illegible]	[illegible]	[illegible]
5.1	16,[illegible]	[illegible]	[illegible]	[illegible]
6.1	21,[illegible]	[illegible]	[illegible]	[illegible]
7.1	26,[illegible]	[illegible]	[illegible]	[illegible]
8.1	31,[illegible]	[illegible]	[illegible]	[illegible]
9.1	41,[illegible]	[illegible]	[illegible]	[illegible]

PARKERSBURG, W. VA.

2.1	1,[illegible]	[illegible]	[illegible]	[illegible]
3.1	6,[illegible]	[illegible]	[illegible]	[illegible]
4.1	16,[illegible]	[illegible]	[illegible]	[illegible]
5.1	21,[illegible]	[illegible]	[illegible]	[illegible]
6.1	31,[illegible]	[illegible]	[illegible]	[illegible]
7.1	36,[illegible]	[illegible]	[illegible]	[illegible]
8.1	47,[illegible]	[illegible]	[illegible]	[illegible]
9.1	57,[illegible]	[illegible]	[illegible]	[illegible]

Increase of stage of Ohio River and duration of same at stated sections, resulting from release of stored waters during the low-water season—Continued

POINT PLEASANT, W. VA.

Increase of stage.	Flow required.	Duration of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.0	11,600	718	539	359
4.0	24,100	346	259	173
6.0	37,800	220	165	110
8.0	52,300	159	119	80
10.0	67,300	124	93	62
12.0	82,300	101	76	50

HUNTINGTON, W. VA.

2.0	9,700	914	686	457
4.0	20,500	432	324	216
6.0	32,600	272	204	136
8.0	45,700	194	145	97
10.0	60,200	147	111	74
12.0	76,000	117	88	58

CATLETTSBURG, W. VA.

2.0	10,500	1,016	762	508
4.0	22,400	476	357	238
6.0	35,400	302	227	151
8.0	49,400	216	162	108
10.0	64,500	165	123	83
12.0	79,800	134	100	67
14.0	95,800	111	83	56
16.0	111,800	95	72	48

PORTSMOUTH, OHIO

2.0	8,200	1,302	976	651
4.0	18,000	593	444	296
6.0	28,600	373	279	186
8.0	40,200	266	200	133
10.0	52,000	203	152	101
12.0	65,800	162	122	81
14.0	79,400	134	100	67
16.0	93,000	115	86	57
18.0	107,000	100	75	50

CINCINNATI, OHIO

2.0	8,800	1,262	947	631
4.0	18,300	607	455	304
6.0	29,500	377	282	188
8.0	41,800	266	200	133
10.0	55,000	202	152	101
12.0	69,300	160	120	80
14.0	84,300	132	99	66
16.0	99,300	112	84	56
18.0	114,300	97	73	49

LOUISVILLE, KY.

2.0	19,200	640	480	320
4.0	55,400	222	166	111
6.0	111,900	110	82	55
8.0	181,900	68	51	34

Increase of stage of Ohio River and duration of same at stated sections, resulting from release of stored water during the low-water season.—Continued

EVANSVILLE, IND.

Increase of stage.	Flow required.	Duration of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.0	[illegible]	[illegible]	[illegible]	[illegible]
4.0	[illegible]	[illegible]	[illegible]	[illegible]
6.0	[illegible]	[illegible]	[illegible]	[illegible]
8.0	[illegible]	[illegible]	[illegible]	[illegible]
10.0	[illegible]	[illegible]	[illegible]	[illegible]
12.0	[illegible]	[illegible]	[illegible]	[illegible]
14.0	[illegible]	[illegible]	[illegible]	[illegible]
16.0	[illegible]	[illegible]	[illegible]	[illegible]
18.0	[illegible]	[illegible]	[illegible]	[illegible]

PADUCAH, KY.

2.0	[illegible]	[illegible]	[illegible]	[illegible]
4.0	[illegible]	[illegible]	[illegible]	[illegible]
6.0	[illegible]	[illegible]	[illegible]	[illegible]
8.0	[illegible]	[illegible]	[illegible]	[illegible]
10.0	[illegible]	[illegible]	[illegible]	[illegible]
12.0	[illegible]	[illegible]	[illegible]	[illegible]
14.0	[illegible]	[illegible]	[illegible]	[illegible]
16.0	[illegible]	[illegible]	[illegible]	[illegible]
18.0	[illegible]	[illegible]	[illegible]	[illegible]

The facts in the above table indicate that while it is not possible to maintain a 9-foot stage from Pittsburg to Cairo with reservoirs alone, such stage can be maintained along the flatter portions of the river, especially those below Huntington, W. Va., except at steep points like the Louisville Falls, where canalization is necessary. These facts are particularly important in view of the report of the Advisory Board of Engineers concerning future navigation improvements on the Ohio River, which has recently been presented. The author of the present report is not informed concerning the specific recommendations made by said Board, but, in view of the showing made in the above table, he contends that no settled policy with reference to navigation improvements in the Ohio should be determined on until these possibilities are taken into account. Of course, it will be necessary to canalize, especially in the upper portion of the river; but it is claimed as a result of these investigations, that it is unnecessary to place a continuous line of locks and dams from the head to the foot of the river in order to insure a 9-foot stage at all periods of the year. The money that would be expended on some of these locks and dams might be used to better purpose in the highland tributaries of the river for the construction of storage reservoirs.

Having now considered the possibilities of conservation in that portion of the drainage area of Ohio River which has been properly surveyed, and the effect of this conservation on floods and navigation in the Ohio, let us consider whether or not the scheme is experimental, or whether, after all, the effects have been actually demonstrated in practice.

Increase of stage of Ohio River and duration of same at stated sections, resulting from release of stored waters during the low-water season—Continued

POINT PLEASANT, W. VA.

Increase of stage.	Flow required.	Duration of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.0	11,600	718	539	359
4.0	24,100	346	259	173
6.0	37,800	220	165	110
8.0	52,300	159	119	80
10.0	67,300	124	93	62
12.0	82,300	101	76	50

HUNTINGTON, W. VA.

2.0	9,700	914	686	457
4.0	20,500	432	324	216
6.0	32,600	272	204	136
8.0	45,700	194	145	97
10.0	60,200	147	111	74
12.0	76,000	117	88	58

CATLETTSBURG, W. VA.

2.0	10,500	1,016	762	508
4.0	22,400	476	357	238
6.0	35,400	302	227	151
8.0	49,400	216	162	108
10.0	64,500	165	123	83
12.0	79,800	134	100	67
14.0	95,800	111	83	56
16.0	111,800	95	72	48

PORTSMOUTH, OHIO

2.0	8,200	1,302	976	651
4.0	18,000	593	444	296
6.0	28,600	373	279	186
8.0	40,200	266	200	133
10.0	52,600	203	152	101
12.0	65,800	162	122	81
14.0	79,400	134	100	67
16.0	93,000	115	86	57
18.0	107,000	100	75	50

CINCINNATI, OHIO

2.0	8,800	1,262	947	631
4.0	18,300	607	455	304
6.0	29,500	377	282	188
8.0	41,800	266	200	133
10.0	55,000	202	152	101
12.0	69,300	160	120	80
14.0	84,300	132	99	66
16.0	99,300	112	84	56
18.0	114,300	97	73	49

LOUISVILLE, KY.

2.0	19,200	640	480	320
4.0	55,400	222	166	111
6.0	111,900	110	82	55
8.0	181,900	68	51	34

Increase of stage of Ohio River and duration of some of usual stages resulting from release of stored water during the low-water season.—Continued

PITTSBURGH, PA.

Increase of stage.	Flow required.	Increase of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.1	1,000	1,356	1,115	67
4.1	2,000	462	315	241
6.1	3,000	420	320	219
8.1	4,000	315	230	159
10.1	5,000	248	182	122
12.1	6,000	192	146	97
14.1	7,000	157	118	79
16.1	8,000	128	102	66
18.1	9,000	111	85	56

PADUCAH, KY.

2.1	2,000	1,000	681	354
4.1	3,000	416	310	207
6.1	4,000	200	158	125
8.1	5,000	150	125	98
10.1	6,000	123	104	78
12.1	7,000	108	94	63
14.1	8,000	107	85	54
16.1	9,000	97	78	48
18.1	10,000	85	71	43

The data in the above table indicate that while it is not possible to maintain a 9-foot stage from Pittsburg to Cairo with reservoirs, the said stage can be maintained during the lower portions of the river, especially those below Huntington, W. Va., except at steep points like the Louisville Falls, where canalization is necessary. These data are particularly important in view of the report of the District Board of Engineers concerning future navigation improvements in the Ohio River, which has recently been presented. The writer of the present report is not informed concerning the specific recommendations made by said Board, but, in view of the showing made in the above table, he contends that no settled policy with reference to navigation improvements in the Ohio should be determined upon until these considerations are taken into account. Of course, it will be necessary to canalize, especially in the upper portion of the river, but it is claimed as a result of these investigations, that it is unnecessary to build a continuous line of locks and dams from the head to the foot of the river in order to insure a 9-foot stage at all periods of the year. The money that would be expended on some of these locks and dams might be used to better purpose in the upstream tributaries of the river for the construction of storage reservoirs.

Having now considered the possibilities of conservation in that portion of the drainage area of Ohio River which has been properly surveyed, and the effect of this conservation on floods and navigation in the Ohio, let us consider whether or not the science is experimental or whether, after all, the effects have been actually demonstrated in practice.

There is in Russia at the head of the Volga and Mtsa rivers a great system of reservoirs that is devoted to purposes of flood prevention and the maintenance of low-water navigation. The two rivers have their sources in the same region, but flow in opposite directions. The country is flat and wooded, and dotted with numerous lakes, which provide excellent facilities for storing flood waters. A great reservoir system, therefore, was developed by the Government, an excellent description of which, together with its effects, appears in the report of Maj. H. M. Chittenden, U. S. Engineers, entitled "Reservoir sites in Wyoming and Colorado," House Document No. 141, Fifty-fifth Congress, second session, pp. 36 and 37, from which the following extracts are taken:

These reservoirs store about 35,000,000,000 cubic feet of water in all, of which 20,000,000,000 can be used in the Volga and 20,000,000,000 can be turned in the other direction, there being apparently a storage of about five or six billions that can be used in either direction. The largest and most important of these reservoirs, and one of the largest in the world in point of capacity, although insignificant in depth and containing dam, is the Verkhnevoljsky reservoir. So slight is the fall of the stream in this region that, although the dam produces a maximum elevation of water surface at its site of only about 17.5 feet, the water backs up a distance of about 60 miles and includes several lakes. The low-water season capacity of this reservoir is about 14,000,000,000 cubic feet, and the average season storage is much greater. Its effect upon the low-water flow of the river below the dam is to raise its normal surface 2.8 feet at Rjef, 96 miles below; 1.4 feet at Tver, the mouth of the Tvertsa, 212 miles below, and 0.14 feet at 410 miles below. At the mouth of the Tvertsa the storage of the Zavodsky reservoir comes in and helps out navigation below. The total navigable distance on the Volga over which the beneficial influence of these reservoirs is felt is upward of 450 miles.

On the Msta slope there are no fewer than 10 important reservoirs, all of them being on the sites of natural lakes, the total storage aggregating about 14,000,000,000 cubic feet. As already stated, about 6,000,000,000 cubic feet of storage which really lies on the Volga slope, including the Zavodsky reservoir, formerly was and still can be turned into the Baltic drainage. This entire system of summit reservoirs that can be used to feed the Msta is called the Vychnevolotsky system. It affords material improvement to the navigable condition of Msta and Volkhoff rivers during the period of low water.

The system of reservoirs above described is certainly a great success, and upon it depends much of the prosperity of the surrounding country. It is probably the most complete example in the world of the joint results of flood prevention and the improvement of navigation produced by artificial reservoirs. It has an importance, however, which it could not have in this country, even with equal physical advantages, for railroads here do a far greater proportion of the transportation business than in Russia. But the example shows how far favorable natural conditions can be made to improve the low-water conditions of streams.

For a partial demonstration of the effectiveness of the reservoir method, reference is made to the conditions at the head of Mississippi River. Here only a part of the possible reservoir development has been made, but even this appears to have been eminently successful, as may be shown by a reading of the report of a board of United States engineers, consisting of Maj. H. M. Chittenden, Maj. Charles L. Potter, and Capt. W. B. Judson (Report of Chief of Engineers, U. S. Army, 1906.) If anything, in addition to that which has been given in previous pages, is needed to prove the usefulness of reservoir systems, a perusal of this report will fulfill all demands. Here is a system constructed primarily for the benefit of navigation; flood prevention was not contemplated, yet, the success of the system in preventing floods, save in a few particular and unusual situations, is as great as the success in navigation. The 5 reservoirs making up this system have a total capacity of over 90,000,000,000 cubic feet, and will conserve the annual flow from 4,250 square miles of drainage

area, except in extremely wet years. In fact, during only one year in the past twenty has there been sufficient run-off to more than fill these reservoirs. The effects on navigation are unmistakable, and by a further development of the storage facilities in the States of Minnesota and Wisconsin the capacity could probably be increased to 175,000,000,000 cubic feet. Therefore, the effects of these reservoirs, as beneficial as they are shown to be along the Mississippi in Minnesota, do not represent the highest possibility of such development.

With reference to their usefulness in preventing floods, objection has been made that their effect is almost inappreciable at St. Paul and totally ameliorated at Lake Pepin. This might have been predicted from the first. The reservoirs conserve only 11.5 per cent of the total drainage area above St. Paul, and therefore, broadly speaking, the severity of the floods at St. Paul will be decreased only in like proportion. There is a drainage area between the reservoirs and St. Paul sufficiently large to provide at times a flood-producing run-off. Of course, this also remains true for the river below St. Paul; at Winona, Minn., for example, the proportion of conserved area to the total drainage area is only 7.3 per cent. Therefore, the complaint above noted appears to arise from a lack of consideration of the facts. No one expects to ameliorate floods if only 11 or 12 per cent of the area is under control. This is well illustrated by the statement of the engineering board above mentioned in its demonstration that the reservoir system was not responsible for the great flood of 1905 at Aitkin, Minn. The following quotation is pertinent:

> In the first place, it may be stated that the drainage area above Pine Knoll, excluding that of the 4 reservoirs above Aitkin, is large enough to produce a flood at Aitkin in times of excessive rainfall if not a drop of water were coming from the reservoirs. This area is about 1,750 square miles, and includes several streams like the Prairie, Swan, and Willow rivers. To produce a high flood, say 12,000 cubic feet per second at Aitkin, would require only about 5 cubic feet per second per square mile, a figure unmistakably reached in times of heavy and continuous rainfall. [Report of Chief of Engineers, 1906, Part 2, p. 1450.]

COST OF THE RESERVOIR SYSTEM

It will be impossible to give precise facts concerning the cost of the proposed conservation system. Such an estimate would require a minute examination of all the physical conditions and a valuation of the property to be submerged. Relative figures, based upon the cost of construction of similar reservoirs in other places, are the best that can be given at the present time. It should be emphasized that this is not a final estimate, and a detailed investigation might serve to reduce or increase the amount submitted. The cost of the different reservoirs per unit capacity will depend principally upon the value of the land to be submerged. A large part of that covered by the proposed system has only nominal value. On the other hand, some of it is good agricultural land, while in a few locations there are coal deposits. Many of these will be worked out in a few years. Exploration of the coal region shows that by far the greater part of the coal lies above the proposed flow lines.

We will use as a standard of comparative costs 97 artificial storage reservoirs of various sizes that have been erected in America, Europe,

India, and other places or which have been projected for erection, with costs carefully estimated. Such a comparison is, of course, merely relative and too great weight should not be given to it; yet, inasmuch as a wide variety of conditions is covered by these reservoirs and the costs thereof vary according to such conditions, it may be expected that the reservoirs contemplated in this paper will approximate in some degree those costs, and the estimate will have the advantage of being based on work actually achieved or which has had the minute study of competent engineers.

It has been found from an examination of these figures and, indeed, it is a matter of common observation among engineers, that the greater the capacity of any reservoir, the smaller the cost per unit capacity. Classifying these capacities and determining the cost per cubic foot per second per year we have the following statement:

Capacity in millions of cubic feet.	Cost per second-foot per year.	Number of reservoirs.
Less than 10	$118,666	3
10 to 50	112,800	5
50 to 100	79,417	10
100 to 500	36,495	21
500 to 1,000	20,775	12
1,000 to 10,000	7,047	35
10,000 to 20,000	1,664	8
Over 20,000	1,210	3

Examination of the various items making up each class in the above table shows that they are fairly uniform and, save for an exceptional entry here and there, there are no unusually wide departures. The averages in each class are justly representative of the class.

We will now consider the cost of the reservoirs specified in tables previously given. There are in the proposed system two reservoirs of capacity of 500 to 1,000 million cubic feet. The foregoing table shows that such reservoirs cost $20,775 per second-foot yield. Multiplying the yield of each of the two reservoirs above noted by $20,775 the result is $1,050,000. Following the same process throughout the entire system, we secure the following statement:

Estimated cost of reservoirs shown in proposed system

Number of reservoirs.	Capacity in millions of cubic feet.	Estimated cost.
2	500 to 1,000	$1,050,000
52	1,000 to 10,000	53,784,000
15	10,000 to 20,000	12,545,000
31	Over 20,000	57,840,000
100		125,219,000

At first glance the costs above suggested seem large, but there are two considerations which will ameliorate the severity of the first impression. The first is that the cost for such a reservoir system will be progressive. The scheme involved is not one that can or should be carried out at one fell swoop, but, on the contrary, it forms the nucleus of a policy which, if adopted, could be the guide to Govern-

ment expenditures in future years. The Government will probably expend an equivalent sum of money for some form of improvement in the Ohio basin during the next twenty years, and therefore the real question to be faced is whether the money shall be expended for permanent improvements in the shape of reservoir construction or shall be expended for canalization and for temporary expediencies, such as dredging. After all, it comes down to a question of which is the best way to expend a given sum of money.

The second feature to be taken into consideration is that the value of any project is not determined by the amount of money used in its construction, but by the final utility of the project. If the value of the proposed system be placed alongside the total cost for construction, assuming the above estimate to be fairly representative, it will be seen that the scheme may be cited as a "gilt edged" investment. Some of the values resulting from the construction of the proposed reservoir system have been cited in previous pages. They may be classed as follows:

1. *Benefits to navigation.*—The reservoir system will make the construction of many of the proposed dams along the Ohio unnecessary. These dams will cost over $1,000,000 each. The effective cost of the reservoir system will therefore be reduced by an amount equivalent to the cost of the locks and dams that it would be necessary to construct in the Ohio if said reservoir system were not installed. Again, navigation on all the conserved tributaries will be improved, and many costly proposed improvements on said tributaries will be rendered unnecessary. Tennessee River, for example, between Riverton and the mouth would be converted into a great navigable highway, with a guaranteed 9-foot channel. The upper sections of the river would be similarly benefited. The cost of the proposed improvements in these tributaries, made unnecessary by the reservoir system, should be credited to said system, thereby reducing its effective cost. Because the author is not in possession of the late report concerning canalization of the Ohio, he is unable to venture an opinion concerning the amount of money which should be credited to the reservoir system by reason of the above considerations.

2. *Benefits arising from flood prevention.*—This is a vast item—no definite estimates can be made. An estimate of the damage caused by the January and March floods of 1907, compiled from local reports along the valley, amounted to more than $100,000,000. This estimate included destruction of real and personal property and interruption of trade, but did not include depreciation. This is the most serious of all flood losses. Trade can be recovered, buildings can be restored, and commodities can be replaced, but the depreciation of real property or the stalling of its development by reason of flood menace is a factor that will persist as long as floods are imminent. The ultimate loss is far greater than all the other factors of flood damage. The proprietor of a great manufacturing establishment on the banks of the Ohio, in discussing with the writer the value of the deep waterways movement, stated that, so far as the real interests of his company are concerned, the desirability of the proposed 9-foot channel is not to be compared with the need for flood relief. He said, in effect:

We can prosper without the water transportation, but [illegible] the flood losses. If floods persist we must move.

WATER POWER

If any method can be devised by which the United States Government can realize a fair return on the additional water power created by the proposed storage system, the entire cost of the reservoirs will be returned to the Treasury. Charges for the power need be maintained only until the cost of the system of reservoirs has been repaid, after which, if it be determined wise, the water rights can be turned over to the water users, after the manner prescribed in the reclamation act of 1902. Let us consider some of the possibilities of power production:

The total fall in the Ohio at Louisville is said to be about 27 feet. A large part of this fall is obliterated during flood seasons, especially when such floods involve the Wabash, Cumberland, and Tennessee rivers, as well as some of the tributaries entering the Ohio above Louisville. It has been estimated that if the tributary basins were conserved up to their maximum the fall at Louisville would be at least 22 feet. For purposes of safety we will consider only 18 feet available. Now, the capacity of the reservoirs proposed in this paper, on the Ohio tributaries above Louisville, is such as to provide for a flow at Louisville during six months of the year of 67,000 cubic feet per second. The unconserved drainage area above Louisville may safely be expected to provide at least an equivalent amount during the remaining six months of the year. Considering then an assured flow of 67,000 cubic feet per second at Louisville and an 18-foot fall, there is indicated an available horsepower of about 110,000. This figure involves only 80 per cent efficiency on power wheels. This amount, figured at $20 per horsepower-year, is equivalent to a 3 per cent income on $73,000,000.

The value of power on the Monongahela dams has already been cited, as well as that on the proposed Youghiogheny dams. An estimate is also given on a previous page of the value of total indicated horsepower made available by the proposed reservoir system in the Great Kanawha basin. Assuming only one-half of this available for economic development, there would be the equivalent of a 3 per cent income on $155,000,000.

The Allegheny, the Cumberland, and especially the Tennessee, might be cited further, but inasmuch as this is not a water-power report the purpose of this section, viz, to show the possibilities of good returns on the proposed investment, will be amply served by the examples given.

In closing, the author begs leave to state that the determination of the enormous water supply possibilities in the Ohio basin, discussed in previous pages, constitutes a part of the work of the United States Geological Survey.

14. FUELS AND STRUCTURAL MATERIALS IN RELATION TO INLAND WATER TRANSPORTATION

By Joseph A. Holmes
Chief Technologist, U. S. Geological Survey

LETTER OF TRANSMITTAL

JANUARY 27, 1908.

SIR: Supplementing my letter of November 21 in response to a letter of October 19 from the Hon. Theodore E. Burton, chairman, Inland Waterways Commission, I respectfully submit the accompanying preliminary report by Mr. Joseph A. Holmes, expert in charge of the technologic branch of the survey, in answer to Mr. Burton's inquiries concerning the relative cost of available masonry, concrete, and reinforced concrete for dams and other engineering works in the United States, and as to the relative cost and efficiency of steam engines and internal-combustion engines, with special reference to the various fuels accessible to and available for navigation and industrial purposes along the lines of water transportation in the United States.

These inquiries from the chairman of the Inland Waterways Commission are similar to those which are received at intervals from a number of other Government bureaus as well as from persons in charge of general building and construction work throughout the country.

All these inquiries illustrate the need for the same information in the work of the Government, and in the development of the industries of the country, namely: The attainment of higher efficiency and economy in the development of power and in the building and construction work of the country.

As illustrating the importance of these investigations I may call attention to the fact that the expenditures of the Federal Government for construction work and for fuels now aggregate from $45,000,000 to $50,000,000 per annum; while the expenditures of the country for similar purposes are not less than $2,500,000,000 per annum.

Very respectfully GEO. OTIS SMITH,
Director.

The SECRETARY OF THE INTERIOR.

THE INQUIRY

The inquiries concerning the relative cost, efficiency, and availability of masonry, concrete and reinforced concrete, brick, and tile for use in engineering works, and the relative advantages of steam engines and internal-combustion engines in utilizing the fuels for

inland navigation and other purposes, which are discussed in this preliminary report are set forth in the following letter from the Chairman of the Inland Waterways Commission:

WASHINGTON, D. C., *October 19, 1907.*

The SECRETARY OF THE INTERIOR.

SIR: Pursuant to recent action by the United States Inland Waterways Commission, I have the honor to solicit information concerning certain matters connected with prospective improvement of the waterways of the interior, viz, the relative advantages of concrete and stone construction for dams and other engineering works; the relative advantages of reenforced concrete for such works, and also for bridges over larger streams; the relative cost of stone, ordinary concrete, and reenforced concrete considered with special reference to sources of materials in: (1) Interior United States; (2) the Rocky Mountain region; (3) the Pacific slope; and (4) the Atlantic slope; and the relative advantages of steam engines and internal combustion engines, with special reference to corresponding sections of the United States and also to prospective use in connection with inland navigation.

Any expert information on these matters would be appreciated, particularly along the lines of recent investigation and practice of those branches of the Interior Department dealing with engineering works and with testing of structural materials and fuels.

Yours respectfully, THEODORE E. BURTON, *Chairman.*

W J MCGEE, *Secretary.*

The inquiries of the Inland Waterways Commission as to the relative advantages, cost, and availability of masonry, concrete, and reenforced concrete for engineering works, have already been answered in part by the chief engineer of the United States Reclamation Service in a letter addressed to the Hon. T. E. Burton, chairman of the Commission, on November 26, 1907—a copy of which letter is herewith appended.

In answer to the Commission's further inquiry as to the relative cost of stone, concrete, and reenforced concrete, considered with special reference to materials available in different parts of the country, especially along the inland waterways, additional data are given herewith.

Concerning the relative advantages of steam engines and internal combustion engines in utilizing the fuels along the inland waterways, for navigation and other industrial purposes, a brief statement is given in the latter half of this report.

SIMILAR INQUIRIES FROM OTHER BRANCHES OF THE GOVERNMENT SERVICE

Both this inquiry and that concerning the cost and availability of masonry, concrete, and reenforced concrete are matters now under investigation, and additional reports will be submitted to the Commission from time to time as progress is made in these investigations.

In this connection I may call attention to the fact that the properties and especially the permanence of concrete and brick depend so largely on the character of the materials used, that these materials should always be thoroughly tested before being used in important engineering works. But the determination of these properties requires tests extending over so long a period of time—in some cases several years—that in the investigations now underway for the concrete and brick we are selecting from different parts of the country, sands, gravels, clays, and stone, which are typical of extensive deposits.

And these investigations being conducted in advance of the actual construction work, will give the information necessary, both for the preliminary estimates of cost and for construction, without the loss in time which would otherwise intervene after the work had been decided upon, in any part of the country.

Inquiries similar to the above are being made from time to time by the supervising architect and officers in charge of the public buildings of the United States, by the Isthmian Canal Commission, by the Reclamation Service, by the Bureau of Steam Engineering and the Bureau of Yards and Docks in the Navy Department, by the Corps of Engineers of the Army, and other Government bureaus, as well as by persons in charge of State, municipal, or private construction work or the various industries throughout the country.

All such inquiries illustrate the need for additional authentic information based upon investigation and experience in connection with the materials available for such construction work, or fuels available for power development in different parts of the country. They also illustrate the fact that this additional information needed in connection with the work of the Government is the same as that needed in connection with the development of the industries of the country, looking in every case to the attainment of higher efficiency and economy in the use of available materials, whether it be for power, heat and light, or for construction.

It is with a view to aiding in the solution of these problems that the Geological Survey has been authorized by Congress to investigate fuels and structural materials; and it is hoped that from time to time as the results of these investigations are made public, that the information obtained for use by the different departments of the Government will also prove useful in industrial development throughout the country.

The expenditures of the Federal Government for construction work and for fuels now exceed $45,000,000 per annum, while the expenditures of the country for similar purposes will probably approximate $2,500,000,000 per annum.

It is believed that these investigations, which are now being conducted under an advisory board on which each of these Government bureaus is represented, may render practicable a saving to the Government and to the people of the country a percentage on these expenditures which will increase as the investigations are extended and the results become available.

STRUCTURAL MATERIALS FOR RIVER AND HARBOR WORK

In spite of the fact that concrete is being used to a larger extent each year, yet there are abundant evidences of the fact that the engineering profession is still seriously in need of information concerning the character of concrete and its behavior under tensile and compression strains; its behavior, in both cold and warm climates, in river and harbor work when exposed between high and low water; when exposed to the action of organic or mineral acids, alkalis, oils, etc.; its behavior under different electrical conditions; and its behavior under different conditions when made up of varying constituent materials; the manner and extent of the reenforcing of concrete, and the percentages of the steel and the distribution of the steel

Increase of stage of Ohio River and duration of same at stated sections, resulting from release of stored waters during the low-water season—Continued

POINT PLEASANT, W. VA.

Increase of stage.	Flow required.	Duration of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
2.0	11,600	718	539	359
4.0	24,100	346	259	173
6.0	37,800	220	165	110
8.0	52,300	159	119	80
10.0	67,300	124	93	62
12.0	82,300	101	76	50

HUNTINGTON, W. VA.

2.0	9,700	914	686	457
4.0	20,500	432	324	216
6.0	32,600	272	204	136
8.0	45,700	194	145	97
10.0	60,200	147	111	74
12.0	76,000	117	88	58

CATLETTSBURG, W. VA.

2.0	10,500	1,016	762	508
4.0	22,400	476	357	238
6.0	35,400	302	227	151
8.0	49,400	216	162	108
10.0	64,500	165	123	83
12.0	79,800	134	100	67
14.0	95,800	111	83	56
16.0	111,800	95	72	48

PORTSMOUTH, OHIO

2.0	8,200	1,302	976	651
4.0	18,000	593	444	296
6.0	28,600	373	279	186
8.0	40,200	266	200	133
10.0	52,600	203	152	101
12.0	65,800	162	122	81
14.0	79,400	134	100	67
16.0	93,000	115	86	57
18.0	107,000	100	75	50

CINCINNATI, OHIO

2.0	8,800	1,262	947	631
4.0	18,300	607	455	304
6.0	29,500	377	282	188
8.0	41,800	266	200	133
10.0	55,000	202	152	101
12.0	69,300	160	120	80
14.0	84,300	132	99	66
16.0	99,300	112	84	56
18.0	114,300	97	73	49

LOUISVILLE, KY.

2.0	19,200	640	480	320
4.0	55,400	222	166	111
6.0	111,900	110	82	55
8.0	181,900	68	51	34

Increase of stage of Ohio River and duration of same at stated sections, resulting from release of stored waters during the low-water season.—Continued

EVANSVILLE, IND.

Increase of stage.	Flow required.	Duration of stage (days).		
		Reservoirs full.	Reservoirs three-fourths full.	Reservoirs half full.
Feet.	*Second-feet.*			
1.1	1,000	1,154	1,115	457
2.1	2,000	495	471	361
3.1	3,000	420	420	310
4.1	4,000	115	290	159
10.1	10,000	248	182	122
22.1	42,000	108	246	97
24.1	72,000	157	118	79
31.1	14,000	208	102	49
32.1	112,000	210	41	38

PADUCAH, KY.

1.1	1,000	1,000	401	254
2.1	2,000	414	110	107
3.1	3,000	200	200	121
4.1	4,000	106	57	19
10.1	10,000	72	24	71
22.1	22,000	126	14	12
24.1	30,000	117	41	34
31.1	32,000	15	71	41
32.1	200,000	41	11	40

The facts in the above table indicate that while it is not possible to maintain a 9-foot stage from Pittsburg to Cairo with reservoirs alone, such stage can be maintained along the flatter portions of the river, especially those below Huntington, W. Va., except at steep points like the Louisville Falls, where canalization is necessary. These facts are particularly important in view of the report of the Advisory Board of Engineers concerning future navigation improvements on the Ohio River, which has recently been presented. The author of the present report is not informed concerning the specific recommendations made by said Board, but, in view of the showing made in the above table, he contends that no settled policy with reference to navigation improvements in the Ohio should be determined on until these possibilities are taken into account. Of course, it will be necessary to canalize, especially in the upper portion of the river; but it is claimed as a result of these investigations, that it is unnecessary to place a continuous line of locks and dams from the head to the foot of the river in order to insure a 9-foot stage at all periods of the year. The money that would be expended on some of these locks and dams might be used to better purpose in the mountain tributaries of the river for the construction of storage reservoirs.

Having now considered the possibilities of conservation in that portion of the drainage area of Ohio River which has been properly surveyed, and the effect of this conservation on floods and navigation in the Ohio, let us consider whether or not the scheme is experimental or whether, after all, the effects have been actually demonstrated in practice.

can be obtained by means of river transportation. Over all this upper portion of the river, furthermore, clays for the manufacture of cement, and sand and gravel of excellent quality for concrete construction are abundant. The sand may usually be dredged from the river's channel. Magnesian limestone and sandstone suitable for concrete is found along not less than 50 per cent of this portion of the river's course.

On the Missouri River good cement materials outcrop from near Kansas City to above Omaha; also from Yankton to points near Pierre, S. Dak. On the lower portion of the Missouri River similar limestone occurs in the vicinity of St. Louis. Sands of good quality are obtained by dredging throughout all the upper portions of the river. Crushed stone for concrete work will probably be derived from all the limestone beds.

The Tennessee River throughout its length from north of Knoxville to Paducah, has almost continuously available limestone of good quality for use in cement manufacture, and the same may be said concerning the availability of clay supplies. Cheap fuels for cement manufacture can be obtained from Alabama and Tennessee.

Along the Ohio River from Pittsburg to Ironton a few light beds of limestone occur near the river and are used at several points in cement manufacture. From this point to Owensboro, Ky., probably one-third of the river's course is bordered by limestones and clays suitable for cement. Sands and gravels occur in the river's bed and may be obtained by dredging; coal is obtained in Indiana, Kentucky, Ohio, Pennsylvania, and West Virginia suitable for use in the manufacture of cement.

The Illinois River is bordered at several points in the vicinity of La Salle and Utica by limestone, clays, and coals of good quality for cement manufacture; and there are also along its course abundant supplies of sand, gravel, and stone suitable for concrete construction.

The Red River and its tributaries northeast of Texarkana passes through extensive deposits of chalk, which, in view of the proximity of clays and coals, can be used even more extensively than now for cement manufacture.

Along transportation routes across the Great Lakes, limestones suitable for cement manufacture are found at but few places. At various points on the lower peninsula of Michigan, as at Bay City and Manistee, near Detroit, and also near Sandusky, Ohio, limestone and marl and clays suitable for cement manufacture exist; and the sand and gravel deposits are available in the same region for the making of concrete.

Pacific coast.—Along the Columbia River, sands and gravels and stone for concrete work are abundant, but no materials are found suitable for the manufacture of cement. In Puget Sound, on the Orcas, and San Juan Islands, limestone has been found and suitable clays occur nearby; and in the adjacent regions of Washington and British Columbia is abundant coal suitable for making cement.

In the vicinity of Los Angeles are several deposits of limestone which are eminently suited to manufacture of cement. Satisfactory clay deposits and cheap oil fuel are available and give promise of large development there in the future, and sands and gravel or stone for concrete construction are easily obtained.

At San Francisco the possibilities of cement manufacture are now partly developed, but do not promise large future developments.

Sands and gravels are available for concrete construction. Broken stone is also abundant.

THE PURPOSE AND PLAN OF PENDING INVESTIGATIONS OF THESE MATERIALS

As indicated above, the primary purpose of the investigation of structural materials now underway is to obtain and to supply such information concerning these materials as is needed in connection with the various building and construction work of the Government.

Attention was called above to the fact that considerable time is required—sometimes two or three years—for the seasoning of concrete masses before the series of tests can be completed. It is therefore a part of this general purpose that these investigations shall be conducted sufficiently in advance of the actual construction work to permit of our obtaining during this time results which may be regarded as conclusive before the construction begins.

The plan of operations involves: (1) Obtaining, largely through the cooperation of the geologic branch of the Survey, information concerning the general distribution of the sand, gravel and stone deposits which appear to be available for use in connection with this work; (2) to select from different parts of the country nearest to the places where the officers of the Government plan to do construction or building work, structural materials (sands, gravel, stone), which are representative of large deposits of material available for this work; (3) to test this material not only by a chemical and physical examination of the material itself, but also by mixing these materials with a typical cement and using these mixtures in the making of blocks of mortar, concrete, and reenforced concrete under a variety of conditions; and (4) after seasoning these masses under a variety of conditions, and for different periods of time, testing them from time to time in such manner as will determine their different properties and their suitability for different classes of construction.

In connection with the inaguration of any new line of investigations, much time is required for the preliminary work of securing adequate equipment, in training of experts to take part in these investigations, in determining exact methods which are to be employed, and in arriving at a certain degree of efficiency and certain general conclusions through tests made with certain types of materials which are carefully selected for this purpose. The materials to be investigated must then be selected in sufficient quantity (from 1 to 10 tons each), so that they can be tested under a sufficient variety of conditions to meet all cases that are likely to arise.

These investigations were inaugurated in 1905; and at the present time not only has a large amount of information been developed concerning the general properties of concrete and reenforced concrete, but in addition to this sands, gravels, and stone have been collected from a number of important localities where Government work has been planned, and concrete and reenforced concrete made of these materials have been tested under a variety of conditions.

USE OF CONCRETE IN WATERWAY IMPROVEMENT

The results of these investigations are now being published as rapidly as practicable. Among the conclusions arrived at, a few are

worthy of mention in connection with the problems now under consideration, as follows:

1. The sand, gravel and stone suited for the making of concrete are so much more generally available on or near the navigable waterways of the country than is stone suited for masonry work, that concrete is probably destined to play an increasingly large part in engineering construction for the improvement of these waterways;

2. While future limited tests of local material may be needed as preliminary to important local construction, yet these general investigations now underway should settle all general questions as to the availability and value of these materials in advance of the construction, thus avoiding the long delays otherwise necessary for testing work before actual construction can be commenced;

3. As concerns the sands, the strength and density of the mortars is greater when the sand is uniformly graded, i. e., when there is a small percentage of voids;

4. While probably no definite law has yet been found by means of which the strength of mortars or concrete using crushed stone screenings may be foretold from mechanical conditions, nevertheless the same rule seems to apply for crushed stone as for sands, i. e., the strength and density are greater as the percentage of voids diminishes.

Letter from the chief engineer of the United States Reclamation Service as to the relative advantages and cost of masonry, concrete, and reenforced concrete:

NOVEMBER 26, 1907.

Hon. T. E. BURTON,
House of Representatives, Washington, D. C.

SIR: By reference from the Secretary of the Interior I have received your letter of November 12, inclosing a letter framed by the members of the Inland Waterways Commission, making certain inquiries.

At my request the Geological Survey, through its technologic branch, is taking up the answer to your question regarding the relative advantages of steam engines and internal combustion engines. The other questions, which I will endeavor to answer as completely as conditions will permit, are as follows:

1. The relative advantages of concrete and stone construction for dams and other engineering works.

2. The relative advantages of reenforced concrete for such works and also for bridges over larger streams.

3. The relative cost of stone, ordinary concrete, and reenforced concrete considered with special reference to sources of materials in: (1) interior United States; (2) the Rocky Mountain region; (3) the Pacific slope, and (4) the Atlantic slope.

All of the materials mentioned—plain concrete, building stone, and reenforced concrete—are up-to-date materials of construction in common use at the present time and are extensively used by the Reclamation Service and by other construction organizations throughout the country. The theory of design of reenforced concrete has been recently developed and the general use of this material has come into great popularity in late years. Plain concrete, on the other hand, like building stone construction, is of ancient origin and use.

A comparison of the relative advantages of the three construction materials in question requires independent consideration for each structure, based on the economical availability of material and the kind of forces to be resisted. For example, a structure of a given type might properly be built of concrete near lines of transportation where cement could be cheaply obtained, and concrete for the same kind of structure might be inadvisable in remote regions where cement is very expensive and where good building stone might be convenient. Likewise plain concrete or stone masonry are not adapted to use for beams, ties, and slabs and whatsoever portions of a structure are subjected to bending and pulling stresses.

The Reclamation Service is constructing two dams under very similar physical conditions on exactly the same plan and for similar purposes. One of these dams is

being constructed of concrete and the other of granite masonry laid in cement mortar. This comparison is made because the former structure is located near railroad communication where cement can be obtained at reasonable cost, while the latter is situated in a locality remote from railroad communication, rendered only by very difficult wagon roads and abounding in excellent granite rock, the use of which requires less cement and gives somewhat better results than obtained by the use of concrete.

The effect of the location of the local conditions of the country in the relative cost of plain concrete, reinforced concrete, and stone masonry is not a constant as the geological differences would indicate. The question of local transportation facilities has more bearing than the geological formations, hence it is impossible to give any data of value along this line.

In general, the advantages of each one of the materials may be set down as follows:

1. Plain concrete is advisable for use instead of reinforced concrete in cases where only compressive stresses are to be resisted and where local conditions make the cost of steel excessive. It is also preferable in many cases where mere weight is important, such as in gravity dams, retaining walls, etc., and where in giving a structure the necessary weight the required strength is also obtained without reinforcement. It is also preferable on account of cheapness, in some forms of pavement, etc., where little strength is required. As compared with stone masonry, increased from some of the other desirable features, concrete eliminates the action of the weather better and may be built into almost any shape without the expense of cutting and dressing.

2. Reinforced concrete is preferable in all cases in which tensile stresses are developed, unless prohibited by local conditions making the cost of steel or cement excessive. The compressive strength of plain concrete is about ten times its tensile strength. While steel has a very high tensile as well as compressive strength. In compression steel will support fifty times the load that concrete will. Whereas in tension it will support twenty-five times the load that concrete will. Any given volume of steel costs about thirty times that of the same volume of concrete. Therefore, to support compression loads with concrete costs only about five times of the cost of such support by steel, and to support tension loads with concrete costs about five times as much as such support by steel. Clearly then the use of a combination of concrete and steel in reinforced concrete where compression and tension are present is an economical process. These conditions exist whenever bending or pulling stresses abound, and therefore are prevalent in the whole or parts of many structures including bridges. On this account engineering practice tends more and more to the building of structures of reinforced concrete as being the cheapest and in many respects the most suitable kind of construction. In general reinforced concrete resists the action of fire better than any stone and is one of the best forms of fireproof construction.

3. Stone masonry is to be preferred where local conditions render it cheaper than concrete, as where great hardness is required and a very hard stone is convenient. Where impermeability to water is important this can be more perfectly attained with a hard compact stone laid in cement mortar than with ordinary concrete. Stone masonry like ordinary concrete has a high compressive resistance but necessarily a low tensile one. It is therefore adaptable to the same class of structures as is plain concrete. As for use in carvings and other ornamental purposes stone masonry is vastly superior to either plain or reinforced concrete.

Very respectfully

A. C. Davis,
Chief Engineer.

FUELS AND CHEAP POWER AS INFLUENCING INLAND WATER TRANSPORTATION

In that part of the Commission's letter asking for information concerning "relative advantages of steam engines and internal combustion engines, with special reference to different sections of the country," and "the prospective use in conjunction with inland navigation," I understand the chief purpose of this inquiry is to develop information from investigations already completed and to be completed which will indicate the cheapest form of power—1 for use in river transportation, and 2 for use in developing industries along the navigable waters of the country, including 3 the practicability of utilizing as the mines low-grade fuels now used, and trans-

mitting electric power thus developed to industrial centers located on navigable streams and on railway lines.

As illustrating the possibility of transporting fuel cheaply with water navigation, I may call attention to the steamer en route (at this date, January, 1908) from Pittsburg to New Orleans, carrying 56,000 tons of bituminous coal on barges at a cost of $1.50 per ton, as compared with the cost by rail, which would exceed $5 per ton.

Cheap power is now universally considered to be a fundamental factor in the development of industries in all countries. While cheap power for navigation is an important factor, cheap navigation and cheap transmission of electric power are also important to the development of industries along our waterways.

STEAM ENGINES VERSUS INTERNAL-COMBUSTION ENGINES AND WATER TRANSPORTATION

The Commission's inquiry is therefore interpreted as calling for the consideration of the relative advantages of the steam and internal combustion engines simply as a part of the discussion of the broader problem—the development of cheap power for navigation and industrial purposes.

The development of the modern gas producer and gas engine is so recent that the exhibition of a 600 horsepower gas engine at the Paris Exposition in 1900 awakened general comment and it was several years later before engines of even this size were being manufactured in the United States; whereas to-day gas engines as large as 6,000 horsepower, of American manufacture, are being operated satisfactorily. A few small gas producers for power purposes were operated in the United States ten years ago, but as late as 1904 when the fuel-testing work of the Geological Survey was begun at St. Louis Exposition it was not generally believed that gas producers could be operated commercially in this country on ordinary bituminous coal. The development of the gas engine and producer have, therefore, only just been entered upon. Nevertheless during the past few years more than 300 gas-producer plants have been installed in the United States; and while more than two-thirds of these plants use anthracite coal and charcoal as fuel, more than 70 per cent of the power developed is developed on producer plants using bituminous coal; and in spite of the still imperfect development of the producer, and our imperfect knowledge as to the chemistry and physics of its combustion processes, these plants, as a whole, are rendering satisfactory service. The belief among engineers is now quite general that the producer and the internal combustion engine have not only come to stay but are a distinct step forward in cheap power development, and in the utilization of our low-grade fuels. In view of the long and more mature development of the steam boiler and the steam engine, it seems hardly fair to draw comparisons between them and the modern gas producer, but the situation may be summarized, briefly, as follows:

1. In relation to the cost and installation of the larger plants in excess of 4,000 horsepower, the cost of the two plants is, approximately, the same. For smaller installation the cost of the gas engine gas producer plant may slightly exceed that of the steam plant.

2. The cost of maintenance between the steam and producer gas plants, in many respects, may be considered as approximately the same, excepting that the internal-combustion engine and the pro-

ducer require at present more skilled and expensive engineering supervision than does the steam plant, and there are available fewer experts trained for the supervision of producer plants, owing to the newness of this form of power development. But the greater efficiency in operating the producer plant reduces the cost of the fuel to such an extent as to show a balance in favor of combined maintenance and operating expenses for the producer-gas plant over the steam plant of about 50 per cent.

3. The growing demand for cheap power without smoke and the consequent development of the producer and gas engine have also greatly stimulated the more efficient development of the steam boiler and engines (including steam turbines). Success in attaining higher fuel efficiencies with each system indicates that each will continue to play an important part in the industrial progress of the country.

4. Other important advantages claimed for the producer gas system are its ability to use efficiently low-grade fuels, even when containing more than 50 per cent ash; the complete abolition of smoke; while for the steam furnace system is claimed greater simplicity, ease of management, and the utilization of exhaust steam for heating purposes.

The situation as to cost of maintenance is illustrated by the following table, taken from a paper on power plant economics by Mr. H. G. Stott, superintendent of motive power of the Interborough Rapid Transit Company, and also a member of the national advisory board on fuels and structural materials.

Distribution of maintenance and operation charges per kilowatt-hour

[Stated in percentages]

	Reciprocating engines.	Steam turbines.	Reciprocating engines and steam turbines.	Gas engine plant.	Gas engines and steam turbines.
Maintenance.					
Engine room, mechanical	2.57	0.51	1.54	2.57	1.54
Boiler room or producer room	4.61	4.30	3.52	1.15	1.95
Coal and ash handling apparatus	.58	.54	.44	.29	.29
Electrical apparatus	1.12	1.12	1.12	1.12	1.12
Operation.					
Coal and ash handling labor	2.26	2.11	1.74	1.13	1.13
Removal of ashes	1.06	.94	.80	.53	.53
Dock rental	.74	.74	.74	.74	.74
Boiler-room labor	7.15	6.68	5.46	1.79	3.03
Boiler room, oil, waste, etc	.17	.17	.17	.17	.17
Coal	61.30	57.30	46.87	26.31	25.77
Water	7.14	.71	5.46	3.57	2.14
Engine room, mechanical labor	6.71	1.35	4.03	6.71	4.03
Lubrication	1.77	.35	1.01	1.77	1.06
Waste, etc	.30	.30	.30	.30	.30
Electrical labor	2.52	2.52	2.52	2.52	2.52
Relative cost of maintenance and operation	100.00	79.64	75.72	50.67	46.32
Relative investment	100.00	82.50	77.00	100.00	91.20

As to the relative efficiency of the steam engine and the internal combustion engine from the standpoint of coal consumption, on 162 tests made at the fuel-testing plant of the Geological Survey, extending over 120 samples of bituminous coals, 9 samples of semi-bituminous coals, 9 samples of lignite, 2 samples of peat, and other

miscellaneous coals, it was indicated as an average result that the development of one horsepower per hour required about 2½ times as much fuel under the steam boiler as was required in the gas producer.

As further indicating the relative losses in converting coal into power through the steam engine and the internal combustion engine, an average was shown at one of the most modern power plants in the country, viz, the Interborough Rapid Transit Company of New York, of 89.7 per cent loss and 10.3 per cent of energy utilized as actual work; whereas the average loss in the producer-gas plant showed 76 per cent loss and 24 per cent energy utilized as electricity.

Modern improvements both in the steam engine and the internal combustion engine equipment are now making such rapid progress that these relative figures may be changed from time to time. The development of each of these systems is greatly stimulating the development of the other. But the advanced position already gained by the producer-gas system, considered in connection with the recentness and immaturity of the producer for bituminous coal, gives promise of a future in cheap power development and the utilization of the low-grade fuels of the country which is most encouraging.

There is also need of further information concerning improved methods of mining coal which will render practicable the removal of from 90 per cent to 100 per cent of the total good coal available in a given bed of coal; and will also render practicable the removal for use in a gas producer the low-grade coals occupying a portion of the same bed or adjacent beds of coal.

But while the development of cheap power and the utilization for this purpose of the low-grade fuels widely distributed in the United States is full of promise, progress in this direction is now seriously retarded by the lack of information—

1. Concerning the real character and composition of the different types of bituminous coal, i. e., the composition is expressed in hydrogen rather than in atoms of oxygen, hydrogen, carbon, etc.
2. Concerning the character and composition of low-grade fuels.
3. Concerning the chemical and physical changes which take place in connection with the combustion processes both in the producer and in the gas engine.
4. Concerning the methods by which in the operations of the gas producer the highest efficiency attained may be attained continuously and on a chemical basis.

One of the difficulties in connection with the operation of the gas producer and the internal combustion engines at the present time is the variability in the quality of the gas as it leaves the producer. Thus in the operations of the producer at the fuel-testing plant of the Geological Survey all gas made and utilized for power purposes would, within a few hours' time, occasionally vary from 125 to 225 British thermal units per cubic foot of gas. If, in cases like this, the highest efficiency of 225 B. t. u. per cubit foot of gas can be maintained continuously the fuel efficiency of the gas producer would thereby be largely increased.

AVAILABILITY OF THE INTERNAL-COMBUSTION ENGINE

Internal combustion engines using gasoline and alcohol are now being recognized as entirely feasible as a motive power for small boats such as small launches, barges, etc.; and these are beginning to be

regarded as feasible for use as motive power for larger vessels such as barges, boats and small tugs. The larger gas producers and gas engines are also beginning to be considered as a possible future motive power for larger vessels, and the necessary modifications in boilers are now being developed successfully. The producer is being reduced in size and simplified, while the gas engine, now successfully built and not available for reducing the movement of the steamer in showing down or backing, is being changed to overcome both objections.

COAL SUPPLIES AVAILABLE FOR INLAND WATER TRANSPORTATION

The Mississippi River and its tributaries are already the important coal-carrying streams of the country, and with the improvement of these waterways not only will the distribution of the heavy products like coal, iron, etc., be cheapened and extended, but also there will be a corresponding development of industry centers, in more or less remote places where coal, water and rail transportation are adequate.

The Mississippi River itself along the western border of Illinois is at a number of points within a short distance of valuable coal deposits and it is joined by several important waterways which penetrate these fields. The coal fields of portions of Indiana, Ohio, Pennsylvania, West Virginia, Tennessee, Kentucky, and Alabama border the Ohio and its various tributaries, such as the Wabash, the Tennessee, the Kanawha, the Allegheny, and the Monongahela, and will yield increasingly large supplies for the purposes of river transportation. During 1907 the coal tonnage of the Allegheny and Monongahela alone was nearly 10,000,000 tons, and this coal tonnage will be largely and continuously increased if the navigation of these streams is improved so as to become available for such shipments throughout the year. The quality of the coal in the different fields bordering the Ohio and its tributaries varies considerably, but they are admirably adapted to the varied needs of the varied industries in the rapidly growing Mississippi Valley region.

The Red River crosses extensive brown lignite areas in Texas, and the Arkansas River penetrates the coal fields of Arkansas and Oklahoma, in which there are large deposits of bituminous and semi-anthracite coal of the best quality for steaming purposes.

The Missouri River skirts the western margin of the coal fields of Iowa and passes through the fields of northern Kansas and Missouri, and while the quality of these coals is not equal to those available along the Ohio and its tributaries, still they are valuable for heat and power purposes. They are now being mined to a considerable extent, and available for extensive future supplies.

The upper Missouri passes through extensive areas of brown lignite in the Dakotas, and especially the North Dakota area gives promise of large future developments for power and domestic purposes.

Briquettes made from these lignites may be expected to play an important part in future Missouri River transportation, if that river is made more navigable.

The Coosa, Cahawba, and Black Warrior rivers in Alabama penetrate coal fields which will yield large future shipments if the navigation of these rivers is improved.

Power development at the mines and its transmission to industry centers bordering inland waterways.—The early power developments in the United States were generally at natural waterfalls on the streams, remote from even the main public highways. Latre came the location of the factories on the railways with power developed through the local steam plant or electrically transmitted from more or less distant waterpowers.

Another system now attracting attention and promising much for future industrial developments is the utilization of low-grade fuels for cheap-power production at the mines, and the electric transmission of this power for varying distances to industry centers located at places where transportation is available by both water and rail for both the concentration of raw material and the distribution of manufactured products.

The investigation conducted during the past few years at the Geological Survey fuel testing plant has indicated that in the modern gas producer low-grade coals carrying as much as 50 per cent ash, or lignites carrying as much as 40 per cent water can be used efficiently for power development; and experience both in this and other countries has demonstrated the practicability of the electric transmission of power for distances exceeding 200 miles.

The advantages of this system would be: (1) the utilization of cheap low-grade fuels, or those rich in sulphur such as are now neglected or wasted in mining operations, leaving the higher grade coals to be used for steam power plants, coking or other purposes for which they are especially adapted; (2) the elimination of freight charges on the transportation of this low-grade material, the power being transmitted as electricity rather than as coal; and (3) the location of factories at places distant from the mines where transportation by both water and rail are available, but without the smoke and ashes, which usually abound at manufacturing centers.

Distribution of these low-grade coals.—The low-grade fuels suitable for power development in the way indicated above are sometimes found in the same beds with high-grade coal, making up a few inches or a few feet on the upper or lower surface of the main bed of high-grade coal; or, in other places, it may make up the entire thickness of the bed. In either case this low-grade material, which would otherwise be neglected, may for the local gas-producer power development be completely and advantageously utilized; while the associated high-grade steam coals or coking coals may be advantageously used for such other purposes near the mines or at distant centers to which they may be transported by rail or by water.

The coal fields bordering the Mississippi and its tributary streams as described above while for the most part abounding in high-grade coals will also yield large supplies of this low-grade coal suitable for local producer power plants, from which the power may be transmitted to numerous industry centers located where both water and railway transportation are available. And the utilization in this way of these extensive deposits of low-grade coals, which must be mined, if at all, at the same time the accompanying higher grade coals are mined, will greatly prolong the life of the nation's fuel.

15. GENERAL RELATIONS OF FORESTS AND STREAMS

By Raphael Zon
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The phase of the relation of forest to climate which is best known and is really the most important in human economy, is the effect which forest cover exerts on the supply of water in streams and on the regularity of their flow.

The amount of water available for stream flow depends on three conditions: First, the amount of precipitation received over their drainage areas; second, the amount of precipitation returned into the atmosphere from the same areas; and third, the behavior of the residue. To understand the effect which forests have on stream flow it is necessary, therefore, to consider separately their influence on each of these main factors.

INFLUENCE ON ATMOSPHERIC PRECIPITATION

Whether or not the amount of precipitation is generally increased to any appreciable degree by forest cover is still a matter of doubt. While some investigators, from the existing measurements, are inclined to think that forest has a perceptible influence at least on local precipitation, others deny it. Regular observations taken at Nancy for 33 years, since 1866, at stations inside, on the edge of, and outside the forest show that without exception more rain has fallen inside than outside the forest, and that in 8 out of 10 cases more rain fell on the edge of the forest than outside. If the amount of the rainfall at the center of the forest be designated as 100, then the amount of rainfall at the edge of the forest would be represented by 93.9, and the rainfall outside the forest, by 76.7. The tendency of moisture-bearing currents to precipitate their moisture more rapidly above or near the forest than over bare or cultivated fields, is due to the dampening and chilling effect of the forest upon the atmosphere which induces condensation of the atmospheric vapor. This has been proved not only by actual measurements at Nancy and other parts of France, but also in Germany, Russia, and India. These observations show that forests tend to increase the total amount of precipitation over wooded watersheds and thus make available more water for stream flow, all other conditions being equal, than barren or deforested areas.

INFLUENCE ON THE EVAPORATION OF WATER FROM THE SOIL

The rate at which water is evaporated from the surface of the soil depends on a number of factors. Chief among these are: (1) Temperature; (2) movement of the air (wind); (3) relative humidity of the air; (4) character of the soil cover.

Temperature.—Careful observations extended over a long period in France, Germany, Austria, Switzerland, and other countries, established the fact that forests reduce the temperature of the air: first, by preventing the heating of the soil by the sun; second, by transpiring water from the leaves—this process of transforming water into vapor absorbs heat and therefore reduces the temperature of the surrounding air; and third, by increasing the nocturnal radiation from the crown.

The yearly mean temperature was invariably found to be less inside than outside a forest. The difference between the yearly mean temperature inside and outside of a forest is about 0.9° F. for forests in level country. This difference increases with altitude and at an elevation of about 3,000 feet it is 1.8° F.

The monthly mean temperature is less in the forest for each month of the year, but the variation is greatest during the summer months, when the difference may reach 3.6° F., while in winter it does not often exceed 0.1° F.

The daily mean temperature shows the same variation, but to a greater degree. The difference between the temperature inside and outside the forest during the hottest days amounted to over 5° F., while for the coldest days of the year the difference was only 1.8° F.

These facts show that the temperature of the air within the forest is on the whole lower but is subject to lesser fluctuations than in the open.

Wind.—The wind exercises a great influence on evaporation by constantly renewing air in contact with the moisture-containing surface. The influence is great during both summer and winter. By breaking the force of the wind and checking the circulation of the air a forest cover reduces the evaporation of water or snow from the forest soil.

Mr. F. H. King, of the agricultural experiment station of the University of Wisconsin, carried on in 1894 a number of most interesting experiments upon the effect which winds have upon the rate of evaporation within and outside the sphere of influence of woods. The first series of experiments was made to the northwest of Plainfield, on a piece of ground planted to corn, lying to the south of a grove of black oaks having on the average a height of 12 to 15 feet. At the time of the experiment there was a gentle breeze from a little west of north. The results showed in one case that the evaporation at 20 feet from the woods was 17.2 per cent less than at 120 feet. In another case, at three stations located within 60 feet from the woods the amount of evaporation was 24 per cent less than at the three farther removed stations located between 280 and 320 feet away from the woods.

Another trial was made by him in the town of Almond, to the south of an oak grove 80 rods square in a field sowed to oats and wheat mixed. The results obtained at the stations located at increasing distances from the woods showed that the amount of evaporation increased until 300 feet from the woods was reached. At this distance and beyond it the rate of evaporation remained practically the same, but at 300 feet the evaporation was 17.7 per cent greater than at 200 feet, and 66.6 per cent greater than at 20 feet from the woods, the difference being due entirely to the protection from the wind which the forest afforded.

Relative humidity.—The relative humidity of the air is higher in the forest than in the open, first because the transpiration of water by the leaves appreciably increases the moisture content of the air within or near the forest; and second, because the temperature of the air is lower in the forest, and therefore the air is nearer its saturation point. Hence, the relative humidity of the air in the forest is higher than that outside, even if the absolute humidity of the air inside and outside were not appreciably different. The relative humidity of the forest air is between 9 and 12 per cent higher than that in the open, and is highest in summer.

Character of the soil cover.—The soil cover in the forest, which is composed of a mulch of fallen leaves and humus, reduces considerably the amount of moisture evaporated from the ground. Experiments conducted during five years (1869–1873) in Bavaria have demonstrated that a layer of fallen leaves is capable of reducing evaporation from the soil 25 per cent. Thus while evaporation from the soil in the forest, deprived of leaf litter, amounted to 47 per cent of that in the open, the evaporation from the same soil covered with a fairly deep layer of leaf litter was only 22 per cent of that in the open. In other words, while the forest cover alone diminished the evaporation from the ground by more than half (53 per cent), the forest cover together with the leaf litter reduced it by 78 per cent, making it less than one quarter (22 per cent) of that in the open. In mountainous forests the evaporation is reduced by the combined influence of the forest cover and such soil covering to from 9 to 13 per cent of the precipitation, thus allowing from 87 to 91 per cent to remain in the soil.[a]

The lower temperatures which exist under a forest cover, the greater relative humidity of the air, the lesser circulation of the air, and the presence of a surface mulch of fallen leaves and humus all tend to reduce the direct evaporation from the forest soil. Observations extending for ten years (1876–1885) in various parts of Germany and Austria showed that the evaporation of water in the open in the vicinity of the forests is equal to 20.9 inches, while in the forest it is only 9.5 inches, or expressed in percentage of the evaporation in the open 46 per cent. In other words, the presence of the forest saves more than half of the evaporation in the open. The Prussian observations for the ten-year period between 1876 and 1885 showed that the per cent of water evaporated from the soil in a beech forest is 40.4; in a spruce forest, 45.3; Scotch pine forest, 41.8; and in young plantations, 90.3 of that evaporated in the open.

INFLUENCE ON LEAF TRANSPIRATION

Besides the loss of water through direct evaporation from the soil, a much greater amount is returned into the atmosphere by the transpiration of the leaves, which in distinction from the physical evaporation may be called physiological evaporation, since it is essential to the physiological function of the trees. Until lately the general opinion, based on the classical experiments conducted by Risler, from 1867 to 1872 at the agricultural experiment station of Rothamsted, England, was that cereals and grasses consume more water for plant transpiration than forest trees. According to these experiments and those of F. B.

[a] Die gesammte Lehre der Waldstreu, etc. Dr. Ernst Ebermayer, 1876, p. 185.

Höhnel (Austrian experiment station 1878), the average amount of water consumed by hardwood forests appeared to be from 6 to 8 inches in depth of water over the ground area in each growing season, and that by coniferous forests from 4 to 6 inches per year. Cultivated crops, such as cereals and grasses, on the other hand, were shown to demand from 12 to 18 inches on the ground area; clover transpired from 13.6 inches to 18 inches, and grass crops even more than this, or from two to three times as much water as average hardwood forests and from three to five times as much as coniferous forests.

From the recent experiments by Ebermayer, Wollny, Henry, Ototzky, and others, however, the water table appears to be invariably lower under forest areas than under grass cover, and under grass cover lower than in a bare cultivated field. In the forest only the upper layer of the soil was found to be moister than in the open, the lower layers being always drier than in the open. Thus, according to Ebermayer's experiments of 1884–1886, the per cent of soil humidity at different depths in an uneven-age spruce forest and in the adjacent field was as follows:

Depth.	Young forest twenty-five years old.	Middle-age forest sixty years old.	Mature forest one hundred and twenty years old.	Field.
0 to 5 centimeters	28.97	29.48	40.25	22.33
15 to 20 centimeters	19.19	19.07	19.29	20.62
30 to 35 centimeters	19.10	16.07	18.29	20.54
45 to 50 centimeters	18.39	16.26	20.22	20.24
75 to 80 centimeters	18.00	17.90	21.12	20.53
Average	20.73	19.76	23.83	20.85

The middle-age forest always produced the greatest desiccation of the lower layers of the soil. This was especially noticeable in summer and fall. In such a forest the soil humidity at a depth of 47 cm. averaged for the summer 15.12 per cent, while in the field at the same depth it was 19.89 per cent. The greater dryness of the soil under the forest is claimed, therefore, to be caused by the transpiration of water by the forest. Since trees produce more organic substance per year per unit of area than other plants, their expenditure of water for the formation of cells must therefore also be greater.

Whether or not this greater transpiration of water by the forest is compensated by the smaller direct evaporation from the soil and greater condensation of vapor over forested watersheds is still an open question. It is, however, generally admitted even by those who ascribe to the forest a depressing influence upon the water table that in mountainous regions with a strongly dissected topography, heavy impermeable soils, abundant snowfalls, short springs, and intermittent summer showers, the amount of water that penetrates into the ground deprived of a forest cover is very small—so small, in fact, as to more than offset the loss of water through transpiration by the forest. In such cases the forest actually increases the amount of water available for tree growth and feeding of streams. If to this be added that surface run-off carries away the soil and in this way reduces the volume of water that can be retained by the remaining soil, the dangers which

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INFLUENCE ON THE STRENGTH OF THE RESULTS

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such water rushes down the mountain slopes, swells the streams, overflows the low-lying country, and deposits the sediment eroded from the mountains on the agricultural land below and in the channels of the streams.

The surface run-off is responsible for all the sudden variations in the water stages of brooks and rivers; the subsurface drainage contributes to their steady and permanent flow. It is important, therefore, that as much as possible of that surface water shall enter the ground. The chief and most effective function of the forest is in increasing the subterranean drainage at the expense of the surface run-off.

The ratio of the surface run-off to subterranean drainage is determined by several factors. Chief among them are: (1) The amount and character of precipitation; (2) the angle of the slope; (3) the character of the soil cover; (4) the amount and character of the soil, subsoil, and underlying rock.

1. *Amount and character of precipitation.*—The heavier and more violent the showers, the greater, all other conditions being equal, is the surface run-off. The forest by its foliage and branches breaks the force of the rainfall so that the water reaches the soil without violence, and at the same time prolongs the duration of the rainfall. After a storm, water continues to drip from the leaves and twigs for one or two hours. The water in the forest, therefore, falls more quietly and for a longer time, and is thus allowed to be absorbed by the soil.

The rapid melting of the snow in the spring, especially when the ground is frozen or is saturated with water, favors surface run-off and lessens seepage. By protecting the snow from evaporation by the wind during the winter, the forest prevents its wasting away, and by protecting it during the spring from radiation protracts its melting for three weeks or more. This, together with the less frozen ground and the greater water-holding capacity of the forest soil, favors subterranean drainage and lessens surface run-off. In this connection the conclusions reached by Mr. L. G. Carpenter, of the agricultural experiment station of Colorado,[a] who has made a study of the relation of forest, melting of snow, and water supply of irrigation streams, are of interest. They are as follows:

(*a*). The mountain streams in the early irrigation season are largely supplied by melting snow.

(*b*). There is a marked diurnal fluctuation, greater with high water than with low, due to the daily variation in the rate of melting.

(*c*). The stream at high water may be one-half greater than at low water on the same day.

(*d*). Cloudy weather in the mountains, protecting the snow from the radiation of the sun, causes the fluctuation to disappear and the flow to decrease.

(*e*). This decrease is so great that the cloudiness associated with continued rain usually more than counterbalances the gain from the rain.

(*f*). The loss of snow by evaporation is considerable, especially when exposed to winds.

[a] Forests and Snow. By L. G. Carpenter, Colorado Agricultural Experiment Station. Bull. 55. 1901, p. 14.

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fact that in the beech forest 73 per cent of the total precipitation reached the ground and in the spruce forest 53 per cent. If the amount of water that penetrated the ground in the open be taken as 100, then in the beech forest it would be 156, and in the spruce forest 142.

Thus the forest produces a soil cover which increases the percolation of water into the ground. This function of the forest is destroyed or reduced by fires, excessive grazing, or overcutting, which change the natural conditions of the forest soil cover. It is not sufficient therefore to have merely a forest, but it must be protected from fire and overgrazing and properly managed if its function in reducing surface run-off and increasing subsurface drainage is to be exercised. It is justly claimed that the flow of surface water can be completely arrested on forest slopes if these are clothed with a healthy forest growth so long as the leaf canopy is maintained.

4. *The amount and character of soil, subsoil, and underlying rock.*—The amount of water which actually gets into the soil is greatly determined by the character and the amount of soil. A barren rock can not retain water, which runs off as fast as it falls. It is the soil that forms a reservoir for retaining the water, and the more there is of it the greater volume of water may be retained by it. The character of the soil, and therefore the kind of rock from which it is derived, affects the percolation of the water into the ground. Thus clay soils will favor less percolation than sandy soil, but no matter what the character of the soil may be, a thin soil cannot retain much water. A forest cover increases both the amount of soil and its absorbing capacity. The forest increases the amount of soil in two ways: (1) from above, by addition of leaves and twigs, which on their decay become a constituent part of the soil; and (2) from below, by inducing disintegration and decomposition of the underlying rock. By constantly increasing the depth of the soil, the forest at the same time guards it from washing away and thus retains it where it was formed. The addition of organic matter to the soil increases its water-holding capacity; at the same time the roots enter the narrow fissures of the rock and by their mechanical and chemical action widen them and thus produce many openings into which the water may freely sink.

Thus it is certain that, of all forms of soil cover, mountain forests most favor the absorption of rainfall by the soil at the expense of surface run-off. This they do by checking the rapidity and force of rainfall; by preventing the washing away of the soil; by increasing its amount and improving its absorptive properties, and as a result increasing its storage capacity.

SUMMARY

The facts which have thus been established relative to the influence of forests upon stream flow may be briefly summarized as follows:

1. By lowering the temperature, forests induce condensation of vapor, and by increasing to some slight extent the aqueous precipitation (dew, mist, rain, snow), make available larger amounts of water for stream flow.

2. By their foliage, soil covering, protection from wind, low temperatures, greater relative humidity, etc., forests reduce the direct evaporation from the ground to about one-fourth of that in the open.

Thus a large proportion of the total precipitation is allowed to become available for stream flow.

3. Forests stimulate the absorption of water by the soil at the expense of surface run-off. By preventing surface run-off and retaining the water in the soil, they tend to moderate freshets and floods and provide for the steady flow of streams.

4. Forests retard the melting of snow and thus provide for the gradual feeding of mountain streams.

5. By preventing surface run-off, forests protect the surface soil from erosion and thus reduce the amount of sediment carried by streams.

6. By stimulating the absorption of water by the soil, forests act as a filter in purifying the water supply.

Such in brief are the scientific facts relative to the influence of forests upon stream flow. While this influence exists wherever forest exists, there is considerable variation in the degree in accordance with the climatic conditions. The forest exerts a lower influence in regions of high humidity, gentle topography, light summer rains, and abundant snow than it does when the topography is more broken, the evaporative factor high, and the rainfall concentrated and intermittent. Its influence increases with the increase in the aridity of climate and irregularity of rainfall. Its efficacy, however, is at a maximum in a region of heavy intermittent rainfall where the humus is most efficacious in promoting absorption and the protective cover in lessening erosion.

16. SPECIAL RELATIONS OF FORESTS TO RIVERS IN THE UNITED STATES

By W. W. Ashe
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PHYSICAL RELATIONS

The physical influences of forests upon streams affect their volume, the regularity of their flow, and the clearness of their water, and are so of great importance through increasing the usefulness of the waterways for navigation, for irrigation, and for power. Their extent varies with the conditions of the watersheds, topography, climate, and soil. They are greater where the surface is broken, the soils either close-textured or deficient in cohesion, the evaporation excessive, and the rainfall heavy, than in regions of gentle topography, permeable soils, high humidity, light summer rains, and abundant snowfall. Forest influences reach a maximum where long droughts and heavy rains alternate, and where the soils are slowly permeable or unconsolidated. Under such conditions the humus is most efficient in promoting absorption, and the protective cover of the forest is more beneficial in reducing erosion. On the other hand, forest influences reach a minimum in level regions of high humidity and evenly distributed rainfall, if the soil is cohesive yet loose enough for water to enter freely.

The conclusions in regard to the physical relation of the forests of the United States to the rivers may be briefly summarized as follows:

1. The influences of the forests upon stream flow and turbidity, while by no means negligible elsewhere, are paramount on the rivers heading in the Southern Appalachians and the eastern slope of the Rocky Mountains, and on the streams of the Southwest flowing through forested or partly forested watersheds.

2. When the natural relations between forest and stream are disturbed in a region where forest influences are high, there is a great increase in the number and height of the floods; there are longer periods of low water; and the damage from floods and from silt and sand which is eroded and deposited as sandbars, goes forward at an increasing rate. This is shown by the wide destruction from floods of the Southern Appalachian streams during the past decade, and by the destruction wrought by the recent uncontrollable torrents of the Southwest.

In accordance with the varying influences of the forest upon stream flow, the most important rivers of the United States may be divided

into six groups, each group situated within a region having similar physiographic and climatic characteristics, where the forests or the watersheds exert like influences upon the flow of the streams.

These six groups are:

1. Rivers of the Northeastern States and the Great Lake region;
2. Rivers of the Middle Atlantic coast region;
3. Rivers of the Appalachians;
4. Rivers flowing from the eastern and southern slopes of the Rocky Mountains;
5. Sacramento and San Joaquin rivers;
6. Columbia River.

RIVER SYSTEM OF THE NORTHEASTERN STATES

This system embraces the rivers of New England, the Hudson River, and the rivers in the region of the Great Lakes.

The most important streams of New England are the Kennebec, Androscoggin, Penobscot, Merrimac, and Connecticut rivers. On these streams navigation is largely limited to the tidal estuaries. The basins are well forested and the natural permeability of the soils is increased by the good humus which rapidly accumulates where granulation, even of the heavy soils, seems to be a natural condition when covered by the deep forest humus; the humidity is high and the evaporation factor low. An extensive system of lakes, which act as natural reservoirs, is instrumental in furnishing an equable stream flow from a moderate but evenly distributed precipitation, which in winter occurs largely as snowfalls, and which passes off as spring freshets after warm rains. Natural storage is also favored by the deep glacial drift, the granitic soils, and the spongy moss and deep humus. Sod naturally sets in ditches, on stream banks, and in waste places, and forms nearly as perfect a protection against erosion as the forest cover. Erosion is slight and the silt burden of the streams is insignificant.

Nine of the principal rivers of the northeastern Atlantic coast have total navigable water of 329 miles, or an average of 36 miles for each stream.

The Kennebec may be taken as a type of the streams of this group. It is navigable to Augusta, Me., the head of tide water; the tidal stream, which is free from all silt bars, is open to boats with 10 feet of draft. Its sources are in the rolling plateau lake region, which is submountainous in part. The soils, of gneissic and granitic origin, in many places covered with glacial drift, are permeable loams and sands on the lower portion of the basin; while equally loose soils derived from sandstones, shales, slates, and conglomerates prevail on the headwaters of the river. The headwaters are heavily forested with spruce, while the lower portion of the river basin is less heavily wooded with pine and hardwoods. A rainfall of 30 to 40 inches is evenly distributed through the year, but the winter precipitation is largely snow, which is released by April and May melting, the snow remaining beneath the protection of the forest from one day to several weeks longer than in the open. The forests have fine humus conditions which afford high absorptive capacity and large water storage. This is also supplemented by an ample lake surface which has a decided equalizing influence on run-off. Dams at the lake

outlets increase natural storage, releasing the water until September, so that the flow of the river is fairly equable except during the spring thaws. The amount of the summer run-off is further maintained by the low surface evaporation, 30 inches from a free water surface, compared with 39 at Boston, and much higher rates farther south and in the drier climate of the southwest. The numerous lakes, the equable rainfall, the heavy forest cover, and the deep humus, all combine to make this one of the most ideal of eastern streams.

The navigable portions of the streams of eastern New England are largely the tidal estuaries, and are not subject to the alternation of violent flood and low water which characterizes streams dependent on rainfall for their depth of channel. The upper reaches, however, are important in log transportation, since the time of the spring flood is the season to which this is usually restricted, while many streams are very valuable for power or as sources of domestic water supply.

The silt burden of these rivers is small, and is largely limited to material corraded from banks, and to the natural deepening of the channels in the rapid portions of the streams. In the discussion of Portland Harbor in the report of the Chief of Engineers the statement is made (Report 1906, part 1, p. 33), that "no silt-bearing streams empty into Portland Harbor, and the improved depth obtained will be practically permanent." While many streams of New England carry silt, the burden, considering the extent of the spring floods, is small compared with that of southern and southwestern streams.

The Penobscot, Androscoggin, and Merrimac rivers may be classed with the Kennebec as having heavy-forested watersheds, with excellent humus conditions, in addition to generally permeable soils and an ample lake area. Surface erosion is slight and the silt burden low. The stream channels are generally free from rapidly forming or shifting silt bars. High spring freshets are followed by well-maintained midsummer flow.

The headwaters of the Connecticut River lie in a much more mountainous region, demanding therefore more extensive protection. Its flow is not so steady as that of the Maine streams. Flood waters gather more quickly and the dry season flow is lower. Erosion, on account of the steep topography and the large farming area, is more active, silt bars having formed in the tidal channel.

Large areas in the White Mountains, where this river has its source, have been stripped of their forests, and subsequently burned. The deep humus and duff, which in many places beneath the spruce formed practically the only soil, has been destroyed. In the absence of the natural absorbent cover, storm waters pass quickly and unchecked into the river.

The Hudson River is similar in general characteristics to the New England streams, but its chief tributary, the Mohawk, drains a thoroughly cleared agricultural valley, and during freshets bears a heavy silt burden. That portion of the river above Troy which comes from the Adirondacks nearly duplicates in general character the streams of Maine. The headwaters are in a region of low mountains with numerous lakes, while the heavy spruce and hardwood forests serve to form a deep, retentive humus which largely prevents erosion, as well as promotes absorption and lessens soil evaporation. While the Hudson is navigable only to the limit of the tidal estuary, the maintenance of

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tions are not destroyed by injudicious lumbering, the present conditions of stream flow can probably be maintained.

The most important problem connected with the control of New England streams is the protection of the headwaters of the Connecticut. The extensive forest areas on the headwaters of this river which have been burned should be reforested, and lumbered lands should be protected from fire to allow early reestablishment of normal humus conditions. Future lumbering should be regulated so that it will in no way jeopardize the humus and soil. On the Hudson River the preservation of the forests of the Adirondacks is necessary to compensate for the extensively cleared valley of the Mohawk, and to protect the lakes from silting up.

The removal of the forests has undoubtedly increased the ratio between maximum and minimum flow especially on the Hudson, Merrimac, and Connecticut rivers. This widened ratio can now be equalized only by increased lake storage, but the existing condition can be prevented from becoming worse by maintaining the present forest cover.

RIVER SYSTEM OF THE MIDDLE ATLANTIC COAST

The most important streams of the Middle Atlantic Coast region are the Potomac, Susquehanna, Delaware, Rappahannock, and James rivers. Eight rivers of this group have total navigable water of 546.8 miles, or an average of 68 miles for each stream.

No one of these rivers is navigable above the fall line, which is at or just above the tidal limit. The maintenance of a mid-summer and autumn flow, regardless of freshets and silting, does not for this reason assume the importance it does on streams which are extensively navigated on other than tidal water. On several streams the supply of water for canals is an important consideration. Their nearness to large cities and their numerous falls and rapids make them valuable as sources of power, while many of them, especially their mountain tributaries, are used for obtaining municipal water supply. The two unfavorable conditions which may be regulated by forest cover are spring and winter freshets, and the silt burden which is deposited largely through these freshets in the slack water of the tidal channel.

These streams rise in the Allegheny Mountains, where their headwaters drain narrow agricultural valleys inclosed by forested but thin-soiled shale and sandstone ridges. The lower portions of their basins are largely cleared, and have rather heavy soils and frequently poor humus conditions, both in the forests and in the agricultural lands. The forest humus, derived chiefly from oak, chestnut, and pine, is naturally scant except at high altitudes and has been further reduced over large areas. Burning, exposing the soil to insolation, and the compacting effects of heavy rains have resulted in erosion.

Stream flow is maintained by a rainfall of from 40 to 50 inches, a feature of which is a heavy, irregular midsummer precipitation, compared with 30 to 40 inches of precipitation on the basins farther north. The considerable winter snowfall is usually removed by warm spring rains, causing floods, which corrade the banks of streams, and also erode the agricultural lands. In addition there are frequent summer and autumn floods, all accompanied by a large silt burden. The floods produce damage to the canals and to riparian property, while the silt is deposited in the estuary channels, where constant

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The construction of storage reservoirs at stream heads will lessen corrosion by the high floods, but unless slopes are properly protected by forest erosion from steep cleared land will continue, not only adding its quota of silt to the stream channel, but threatening to reduce the capacity and efficiency of the storage reservoirs as well.

RIVER SYSTEM OF THE SOUTHERN APPALACHIANS

This group includes a very large number of rivers, many of them large and at present extensively navigated. Their navigable stretches, however, can be greatly extended by furnishing a more uniform flow, and their usefulness can be largely increased by securing additional channel depth either by artificial storage or by canalization. The flow of these rivers is characterized by high floods at irregular intervals, though usually in the spring, bearing enormous quantities of sand and silt, followed by long periods of low water.

This system embraces the greatest number and most important navigable rivers of the United States.

On the South Atlantic drainage, the Roanoke, Neuse, Tar, Cape Fear, Santee, Savannah, and Altamaha rivers are all important.

On the Gulf drainage, the Appalachicola and Mobile River systems embrace many hundred miles of navigable waters and traverse the coal fields of Alabama.

The Tennessee, Cumberland, and Kentucky River basins cover the entire State of Tennessee, a portion of northern Alabama, and central and western Kentucky. The Ohio River system embraces about 1,450 miles of navigable water. The lower Mississippi is largely an extension of these streams, and its flow is chiefly dependent upon their stages.

These rivers have their sources in the Appalachian Mountains or in the adjacent plateau regions. In the lower portion of the Mississippi Valley there are a few streams subject to nearly the same influences, such as the Pearl River of Louisiana, which can appropriately be included. Fifty-seven of the Appalachian streams have 9,241.5 miles of navigable water, or an average of 162 miles for each river. Most of them are navigable many miles above the tidal limit. For this reason the maintenance of a high flow during the dry season is important, as is also the reduction in the height of floods, which seriously interfere with navigation on the upper reaches. Closely related in effects to the dry-season flow is the silting up of channels, which reduces the depth of navigable water. The power which can be developed from these rivers is in many instances as important as their use for navigation, especially in those regions which are remote from the coal mines.

The most typical streams rise at high elevations, 3,000 to 5,000 feet, in the Appalachian Mountains, where they are fed by many swift tributaries. Leaving the mountains they flow less rapidly through the hill country of the Piedmont Plateau or the rolling farm region of the Mississippi Valley. There is an entire absence of lakes and natural reservoirs. Except in the most rugged portion of the mountains the soil mantle over the greater portion of this region is extremely deep—from 20 to 50 feet. The soils may be separated into three classes: (1) Loams and sands which are fairly permeable and have high storage capacity; (2) silts which are less permeable and

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The irregular, concentrated character of the precipitation associated with these other favorable conditions frequently produces high freshets, not only in winter and early spring, when warm rains release the stored waters of snow and ice in the mountains, but during the summer and occasionally autumn as well. The violence of these freshets, in which the rise of water at the fall line of the rivers frequently amounts to from 30 to 60 feet, temporarily checks navigation. On the other hand, during periods of drought, which occasionally extend to sixty and ninety days, the stream flow decreases until the depth of water in the channels is too shallow for navigation. Rises of 50 or more feet above low water are known to take place in the Cape Fear, the Alabama, the Cumberland, and the Ohio, as well as in other streams. While there has always been a wide limit between high and low water in the southeastern streams, the ratio has undoubtedly widened as the removal of the forest and the destruction of the humus in the remaining forest have produced those conditions which concentrate in the rivers the flow of the water of severe storms. The following table shows the increase during a period of fifty years in the number of floods on the Ohio River at Wheeling.[a] The flood stage is 20 feet.

Period.	No. of floods.	No. of days of flood.
1838-1847	34	102
1888-1897	50	147
1898-1907	55	220

On the Cumberland River at Burnside, Ky., there has been a similar increase in the number of floods above the stage of 40 feet. No figures are available for the period before 1891.

Period.	No. of floods.	No. of days of flood.
1891-1895	3	3
1896-1900	8	19
1901-1905	13	13

The Alabama River at Selma shows a like increase for the period for which figures are available. The floods are above a stage of 35 feet.

Period.	No. of floods.	No. of days of flood.
1891-1895	6	62
1896-1900	5	41
1901-1905	11	86

The Savannah River at Augusta, the Santee, and many other southeastern streams show similar increase. The losses from floods on southern Appalachian streams during the past ten years aggregate more than $35,000,000, more, probably, than those of all the rest of the United States.

[a] Figures are not available for the period between 1848-1887.

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detrimental to water power utilization, reducing after each flood the impounding capacity of the reservoirs. It is stated by Mr. W. S. Lee[a] that the capacity of the reservoirs of the Southern Power Company, on the Catawba and Broad rivers, is being so reduced by silting up that in a few years only the flow of the streams will be available for power.

The natural means for attaining greater regularity of stream flow, for reducing the height and number of freshets, and for shortening the dry season low flow, is the same as that for lessening erosion, the promotion of soil absorption of storm water, and the reduction in the amount of surface run-off. While a perfect regimen can not be fully realized, it is possible by proper means to greatly improve the present conditions:

(1) By the reestablishment of proper humus conditions in the forests of both the mountains and the Piedmont Plateau. (2) By the reforesting of steep lands in the mountains which have been in cultivation and which have become so exhausted that they no longer will retain a grass sod. When this condition obtains, rapid erosion takes place. (3) By the reforesting of all steep land in the Piedmont Plateau which can not be cultivated without erosion, since it is impossible to maintain a grass sod on steep land in this section on account of the low humidity and long, hot growing season. (4) By improvement in the method of tillage on such soils as are deemed agricultural, in order to prevent erosion from them and promote absorption of heavy rainfall by them. This can be done by terracing, by deeper plowing, by an increase in the amount of humus, and by rotation of crops. The effects will be beneficial not only upon stream flow and in lessening erosion, but in improving the value and increasing the yield of farming lands. (5) By planting trees along the banks of brooks and small streams which are being badly washed, and by reforesting or maintaining in forest alluvial lands which are subject to flooding and which erode when cleared.

RIVERS OF THE EASTERN SLOPES OF THE ROCKY MOUNTAINS

This group of rivers embraces many streams of great length flowing east and south through the plains or from the eastern and southern slopes of the Rocky Mountains. The most important are the Missouri, Platt, Arkansas, Kansas, Red, Trinity, Brazos, Sabine, Colorado (of Texas), Rio Grande, and Colorado rivers. Only a few of these streams are navigable, on account of their erratic flow, a period of high water in the late spring or early summer being followed by a long period of extremely low water, with very high freshets at irregular intervals. Many of them, however, can be canalized, and they are valuable as sources of power and for irrigation. The silt burden is so excessive that many of the rivers have meandering channels from the deposit of the sediment. Thirteen rivers heading in the Rocky Mountains or in the Great Plains, including the Red, Sabine, and the rivers of Texas, have total navigable water of 2,869 miles, averaging 220.5 miles for each river. The period of navigation is very short, however, on account of the prolonged low water.

[a] Before the Committee of Agriculture, House of Representatives, January 30, 1908.

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conditions exist on the mountain tributaries of the Missouri as on the head of the Arkansas River.

The flow of the main river during the dry season is maintained almost entirely by the mountain tributaries. Since this flow largely comes from the melting snow and subsoil percolation of snow water, the development of the protective forest mantle to its widest limit is necessary to retard melting of snow and to promote absorption and storage of snow water. Of the entire forest area of the basin, only 14,921,600 acres are situated in the national forests, and more than two-thirds of this has within the past fifteen years been badly burned, and the humus, through which absorption is largely promoted, has been partly or entirely destroyed. And this condition is applicable to all of the rivers of the plains which have their sources in the mountains. The mountains are the origin of the water of their dry-season flow. The streams which lie entirely in the plains either go dry or nearly so during periods of drought.

Notwithstanding its large drainage basin, the flow of the Platte is erratic, being especially characterized by the low dry-season flow. The rainfall of the basin is too limited in quantity, averaging less than 25 inches, and too irregularly distributed, being marked by a high midsummer maximum and a low winter precipitation, to maintain a steady stream flow. Moreover, there is a marked deficiency of snowfall on the mountainous portions of the basin. A very small proportion of the basin is forest covered. Of the forested area, 2,609,576 acres are situated in national forests.

The excessive silt burden of the Platte is largely derived from the treeless areas below the mountains. Many of its most important tributaries normally pass from the mountains as clear streams, their turbidity being acquired from tributaries which enter below the mountains and which are not navigable. Its surcharge of silt adds to the excessive turbidity of the Missouri, with its marked influence on the deposits of the lower Mississippi. The limited silt burden of the perennial head streams is undoubtedly greatly influenced by the forests which protect them.

The rainfall on the Platte rapidly decreases immediately below the mountains to 10 inches or less, but again increases eastward until it amounts to 35 inches at its mouth. The banks of most of the tributaries on the plains are unprotected by trees, and are subject to excessive corrasion, and at the same time most of the soil moisture is subjected to an evaporation by dry winds, and this evaporation amounts to several times the annual rainfall.

All the streams rising in the eastern or southern slope of the Rocky Mountains, or in the plains to the east of the Rocky Mountains, have characteristics similar to those of the Missouri or Platte—an extremely low minimum run-off for the size of the drainage basin, a heavy silt burden, and so great a deposit of sand and silt as to cause meandering.

The Kansas, which heads in the plains, is not navigable.

The Arkansas, which exhibits the same influences, has its headwaters fed by the snow fields of the high mountains of central Colorado, especially of the Continental Divide, and its lower course receives many steady tributaries from the Ozark region, a section of broken topography and heavy precipitation. Its headwaters are protected by 1,861,426 acres of national forest, including 431,360

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The climate of the southern part of the Rocky Mountains is very different from that of the northern portion. Not only is the snowfall lighter, but the summer temperatures are higher, the humidity lower, and winds higher, developing general conditions which accelerate the destructive oxidation of humus, and at the same time retard its development by determining a more xerophytic forest type than that which characterizes the region north of Yellowstone Park. The natural factors which effect the destruction of humus act more rapidly and the means for its replacement operate more slowly. For these reasons it is more necessary to nurture in the south the sources of its accumulation, and to take every precaution to lessen its destruction. This condition, which is the same as that which exists in the Appalachians, increases just as it does in the Appalachians toward the south, so that it becomes in the southern portion of the Rocky Mountains more difficult to maintain a humus covering and a freely permeable soil.

2. The silt burden is largely derived from the unconsolidated soils which form the banks of the streams of the plains. This silt when once washed into the main channel is either borne in suspension, as is the case with the light silt, or rolled along on the bottom, as is the sand. The mountain streams bear a small proportion of this silt. Agricultural lands contribute a relatively insignificant part of this. Protection of the banks of large navigable streams can be effected only by engineering means, though in some places it is possible that shrubs might be planted along them. Trees on stream banks are dangerous to navigation, but on the smaller streams the banks can be protected by shrubs, and by trees whenever there is no danger of their being washed up and carried into navigable channels.

STREAMS OF THE SACRAMENTO BASIN

The Sacramento, San Joaquin, and Feather rivers are the chief waterways of California, the navigable portions of the two former being largely limited to the tidal estuary channels. Low-water stages, therefore, do not seriously affect them, but their value for navigation has been menaced by silting. In addition, meandering of the streams has in cases taken place, threatening the destruction of riparian property, as well as interfering with navigation.

Three navigable streams heading in the western slope of the Sierra Mountains have 492 miles of navigable water, or an average of 164 miles for each river. These streams differ from those of the southeasterly and eastern slope of the Rocky Mountains in possessing navigable estuary channels, while the precipitation on their basins is largely during the winter months, when it is often concentrated in heavy showers. The streams are subject to violent early spring freshets, originating in the heavy rains in the mountains, while their high silt burden has damaged the navigable estuary channels. The greater portion of the silt of these streams was formerly the product of hydraulic mining, but the necessary means have been taken to control this through settling beds. In spite of this the Sacramento River yet bears annually more than 2,250,000 tons of solid burden. Much of this is acquired in the foothills and plains, though much erosion takes place from forest land on account of the insufficient humus. Corrasion is active on the Tuolumne, Stanislaus, and other

streams of the Sierras which debouch into the Sacramento or San Joaquin rivers. This excessive action is more or less constant, being a characteristic of streams coursing through unconsolidated soils or those deficient in cohesion, as are many of those of the California basin. This action might be lessened on the smallest tributaries by protective planting. Extreme irregularities in the character of the precipitation add to the streams' degrading influence, and make the lessening of erosion an important consideration. While the general rainfall of California is light, 12 to 35 inches, one-half of it falls during the three months of December, January, and February, and in years of maximum precipitation the rainfall during this three months' period will often equal or exceed that which would fall in the southeast Atlantic States during the same time. The rainfall of lower altitudes is frequently concentrated, a character especially favorable for erosion. Only at the higher elevations is a large part of it snow and its melting is often forced by a warm rain. Perpetual snow fields are found only at the highest altitudes, as on Mount Shasta and Mount Whitney, and they do much toward sustaining stream flow during the dry season.

An additional factor favoring erosion is the thinness of the cover of protective vegetation. This is due to the irregularity of the rainfall as much as to its scantiness, while the high transpiration factor, which in the southern part of the State is probably the highest in the United States, likewise reduces the available soil moisture.

As the arid foothills are entered there is a wide belt with steep slopes and loose soils, which on account of the irregular concentrated rainfall is subject at times to excessive washing. This is below the natural forest limit. If no arborescent species can be maintained upon this zone, deeply rooted chaparral should be favored to lessen erosion as far as possible.

The snow fields of Mounts Shasta and Whitney, which yield perennial streams, do much to maintain equable stream flow. The protection of the snow by the forests of the high Sierras and the maintenance of good humus conditions is essential to safeguard greater extremes of flow, accompanied by further cutting of stream banks and additional meandering and silting of lower level reaches. The necessity under these conditions for the fullest development of the protective forest cover and its accompanying humus are evident, while the difficulty of maintaining it, as has been pointed out, is proportionately great, on account of the restrictive influence of irregular precipitation and a high evaporation factor, due to an arid climate, and desiccating wind.

The area of national forests protecting the Sacramento River watershed amounts to 3,307,094 acres, and that protecting the Sacramento River basin to 3,023,124 acres. A very large portion, probably 50 per cent, of this forest, as well as of other forests on their headwaters, has been opened by repeated fires, and the naturally poor humus has been destroyed or further depleted. The accumulation of a good humus in these forests is imperative and the extension of the protective cover, either of dense chaparral or of forest, over the foothill land is advisable. Reforesting these watersheds not only reduces the severity of the floods to which these mountain streams are subject, but frequently converts a stream with intermittent flow

into a perennial one, or greatly augments the dry-season flow of those subject to the violent fluctuations.

There is urgent necessity also for planting the banks of small streams to lessen the constant corrasion which is taking place.

COLUMBIA RIVER

This river and its tributaries have nearly 800 miles of navigable water. It will eventually be developed into one of the great water highways, although its value may be lessened by the fact that a portion of it is situated in British Columbia, and its full use may be deferred on account of the navigable stretches being interrupted by intervals of rapids, gorges, and canyons. Many of the rapids and falls, however, may be avoided by canalizing, yielding at the same time commercial power. Portions of the Columbia are already navigable far up into Idaho to the Clarks Fork. The Pend d'Oreille is regularly plied by steamers between Newport and Iona, and could be navigated through the lake and for a long stretch beyond but for falls above Newport. Boats likewise ply regularly on the St. Joseph, St. Marys, and on the Snake River to Lewiston, above which place the river passes through the canyon carved in the basalt plains. But long stretches of the Lewis Fork are navigable up to a point 480 miles above the mouth of the Columbia, and this could be extended much farther. Even on the upper portions of several of these streams there are many miles of deep placid water. The tidal channels of both Columbia and Willamette extend for more than 100 miles above their mouths.

The salient feature of the Columbia is its evenness of flow and its clearness. The streams which most closely resemble it are those of New England, but the flow of the Columbia is probably more uniform than that of any other large stream of the United States. This condition is due to several causes.

There are two sources of its tributaries: The coast and Cascade Mountain regions on the west, which chiefly affect the flow of the Willamette; and the Cordilleran area of Idaho and Montana, in which lie the headwaters of the main river. Between these two mountain regions are extensive areas of plains and elevated rolling plateaus, unforested and with scant rainfall, dissected by several of the large streams, but the source of few small ones within their limits.

Over the western mountain area the rainfall is heavy, from 60 to 70 inches; it decreases on the eastern slope of the Cascades in the plains areas to less than 15 inches, rising as the Rocky Mountains are approached to 20, and attaining, in the mountains of northern Idaho, and on the headwaters of the Clarks Fork, a maximum of 35 inches; and in southeastern Idaho and Wyoming, on the headwaters of the Lewis Fork, a maximum of 30 inches. This precipitation is relatively slight, but it is of a character to render it available for soil absorption; while the prevailing surface conditions are likewise highly favorable. The precipitation during the summer is extremely low compared with that during the winter, but is in the form of gentle showers, giving the fullest opportunity for entire absorption, with a very small amount of surface run-off. The winter snowfall is heavy, especially in the eastern mountains, and the deep snow banks, in canyons, gulches, and north hollows, protected by the dense forests

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condition of the soil greatly impaired. This has been due in part to the character of the fires, in part to the character of the forests and humus, and in part to the climate.

While the fires have been destructive, killing the timber as well as burning the ground cover, reburnings of the same area are not frequent or periodic, as in the Southeastern States and portions of the Southwest. The humus had accumulated to great depths before being burned, and a single fire only burned through the drier superficial layer. The burning of the humus is, moreover, frequently checked by light summer rains.

For this reason, that the destruction of the humus is incomplete, the facies of the soil toward absorption of rainfall and erosion has scarcely been disturbed. Exhausting tillage will in time reduce the humus, and extensive denudation and cultivation of the slopes will produce conditions more favorable for erosion. As repeated fires occur in the forest, the vigor appertaining to a virgin soil will be depleted, as in many portions of the Appalachians. With the destruction of the humus the forest will become open, scattered clumps of trees, admitting the sun and wind, which will not only accelerate the melting of the snow but lessen the soil permeability and produce those conditions which are favorable to erosion. While this condition favoring erosion exists in the eastern portion of the basin in the Rocky Mountains, its maximum obtains under the high precipitation of the Coast and Cascade Mountains. But with adequate humus and slope protection within the spheres of high precipitation, the at present almost insignificant silt burden of the streams will not increase under natural conditions to damaging proportions. At present drifting sands on the river banks in places are a menace, and they may be the origin of the sand which forms the bars in the estuary channels.

Many of the streams on the lower portion of the basin acquire their constancy from glacier sources. Some of them bear a considerable amount of coarse sand, but most of them not sufficient to affect their clearness. The glaciers, and the excellent humus even within the burnt forests, produce most favorable conditions for equable stream flow and low-silt burden.

The few other streams in the Northwest are of minor importance, and present largely the same conditions which obtain in the Columbia River.

The chief need of the Columbia basin is maintenance of the present forest cover and reestablishment of normal humus conditions where the forests have been burned.

SANITARY RELATION BETWEEN FORESTS AND STREAMS

In addition to their physical effects upon streams, the forests exert a strong influence upon the purity of water for domestic uses. The waters from forested watersheds are generally free from pathologic bacteria and, considering that they are surface waters, are of excellent quality for municipal supplies. Many of the smaller cities and a few of the larger cities, like Portland, Oreg., use such water, and find it satisfactory, even without filtration.

It is especially desirable that small cities and towns which are near primarily pure sources, such as forested mountain streams, should use these rather than wells and springs or than the water of large

rivers which has received contaminated matter from the towns. The use of such pure water not only checks the spread of water-borne diseases in the town using it, but since its sewerage has proportionately fewer typhoid bacilli, it tends to lessen the transmission of the contagion to other towns at lower points on the rivers which use the sewage-contaminated water for drinking purposes. Purified waters are only relatively pure, their quality depending upon the original amount of contamination. But if the purity of the water from a forested watershed is further safeguarded by filtration, a water of the highest quality is obtained.

The case of the typhoid fever epidemics in the Kennebec River Valley, as described by Whipple and Long,[a] is one of contagion, transmitted from the upper towns to the lower, the impurity of the water increasing as it received the impurities of each successive town, with the increased prevalence of typhoid fever epidemics. Another case is that of Wilkinsburg, Pa., a city which uses the water of the Allegheny River. The river receives above Wilkinsburg the sewage of nearly 20 towns. Numerous outbreaks of disease in the upper towns have been transmitted to the lower, and the health of the people of Wilkinsburg has been affected by nearly every such outbreak in the towns above it.

With the rapid increase in the density of population in the eastern States and the further congestion of towns along the important rivers, the sanitation of the streams presents a vital problem. The solution of this problem can properly begin with the general use, by towns in the hilly and mountainous portions of the country, of water from forest-covered watersheds at the heads of the rivers.

Moreover, so far as the forest increases the minimum or dry-season flow of streams, it adds, by dilution, to the relative purity of the water, fewer impurities being contained in a given volume. Likewise, by lowering flood crests, fecal and other impure matter which accumulates along the banks of a stream in a thickly populated region, especially in and near cities and towns, is not swept into the streams, but undergoes harmless destruction by natural decay. This lessens the impurities of flood water.

RELATION OF FORESTS TO ENGINEERING MEANS OF RIVER CONTROL

As the influence of the forest has decreased, on account of the smaller area of normal forest, engineering methods of stream control have become necessary. Such artificial means of control must be used to compensate for the cleared land which is in the farms. They must be proportionately extended on account of the large areas of waste land, which has its soil hardened and baked by the sun and is unabsorptive, and to compensate for the forest which has been lumbered and burned, and the soil of which has partly lost its porousness and storage capacity.

The value of engineering methods of control depends, however, on how thoroughly the headwaters of the rivers are forest protected. In those regions where forest influences are high there is a limit beyond which engineering means of control fail. The forest, acting

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not over one limited portion of a watershed but over a great portion of it, produces certain conditions which can never be entirely replaced by engineering methods. The dam, the reservoir, the settling bed, and the levee influence only the reaches of the stream below them. The forest at headwaters influences the régime of the entire river. When the influence of the forest decreases below a certain limit, engineering works are futile; their efficiency rapidly fails, and even their very existence is threatened. The storage capacity of the reservoir and settling basin is destroyed by the sediment which is washed from the bare and hardened slopes; the bed of the canal is filled with silt; the channel of harbor and river is choked in spite of the dredging. The accumulation of the detritus from the scourings of unprotected soils threatens the levees by the gradual raising of the river bed and requires the continual extension of the jetties. As the floods at headwaters become higher, with more erratic stream flow, the very dams which are built to restrain them are endangered; the canals and locks on their banks are swept away, the abattis, cribbing, and dike are destroyed or rendered useless.

The work of the engineer to protect and develop the large river becomes useless unless it is protected by the forest. In the Appalachians, in the Rocky Mountain region, and in the Southwest, and indeed wherever forest influences are high, the river engineer and the forester must work hand in hand.

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ROADS AND CANALS.

(Communicated to the Senate, April 6, 1808.)

TREASURY DEPARTMENT, *April 4, 1808.*

SIR: I have the honor to transmit a report respecting roads and canals, prepared in obedience to the resolution of the Senate of the 2d of March, 1807. It has been unavoidably delayed much later than was desirable, or had been expected. Although early steps had been taken for obtaining the necessary information, the most important documents were not received till long after the commencement of the session, some, indeed, within the last ten days. To analyze the whole, to select, arrange, and condense the most interesting facts was also a work of some labor. Time has not permitted to present the report in a more satisfactory form; but the mass of facts which has been collected will, it is hoped, be of some public utility.

I have the honor to be, with great respect, sir, your most obedient servant,

ALBERT GALLATIN.

Hon. GEORGE CLINTON, *President of the Senate.*

The Secretary of the Treasury, in obedience to the resolution of the Senate of the 2d March, 1807, respectfully submits the following report on roads and canals:

The general utility of artificial roads and canals is at this time so universally admitted as hardly to require any additional proofs. It is sufficiently evident that whenever the annual expense of transportation on a certain route in its natural state exceeds the interest on the capital employed in improving the communication, and the annual expense of transportation (exclusively of the tolls) by the improved route, the difference is an annual additional income to the nation. Nor does in that case the general result vary, although the tolls may not have been fixed at a rate sufficient to pay to the undertakers the interest on the capital laid out. They, indeed, when that happens lose; but the community is nevertheless benefited by the undertaking. The general gain is not confined to the difference between the expense of the transportation of those articles which had been formerly conveyed by that route, but many which were brought to market by other channels will then find a new and more advantageous direction, and those which on account of their distance or weight could not be transported in any manner whatever will acquire a value and become a clear addition to the national wealth. Those and many other advantages have become so obvious that in countries possessed of a large capital, where property is sufficiently secure to induce individuals to lay out that capital on permanent undertakings, and where a compact population creates an extensive commercial intercourse, within short distances, those improvements may often in ordinary cases be left to individual exertion without any direct aid from Government.

any work which it may undertake, as fast as the work itself can progress; avoiding thereby the ruinous loss of interest on a dormant capital, and reducing the real expense to its lowest rate.

With these resources and embracing the whole Union, it will complete on any given line all the improvements, however distant, which may be necessary to render the whole productive, and eminently beneficial.

The early and efficient aid of the *Federal* Government is recommended by still more important considerations. The inconveniences, complaints, and perhaps dangers, which may result from a vast extent of territory, can no otherwise be radically removed or prevented than by opening speedy and easy communications through all its parts. Good roads and canals will shorten distances, facilitate commercial and personal intercourse, and unite, by a still more intimate community of interests, the most remote quarters of the United States. No other single operation, within the power of government, can more effectually tend to strengthen and perpetuate that union which secures external independence, domestic peace, and internal liberty.

With that view of the subject the facts respecting canals, which have been collected in pursuance of the resolution of the Senate, have been arranged under the following heads:

1. Great canals, from north to south, along the Atlantic seacoast.
2. Communication between the Atlantic and western waters.
3. Communications between the Atlantic waters, and those of the Great Lakes, and river St. Lawrence.
4. Interior canals.

GREAT CANALS ALONG THE ATLANTIC SEACOAST.

The map of the United States will show that they possess a tide water inland navigation, secure from storms and enemies, and which, from Massachusetts to the southern extremity of Georgia, is principally, if not solely, interrupted by four necks of land. These are the Isthmus of Barnstable, that part of New Jersey which extends from the Raritan to the Delaware, the peninsula between the Delaware and the Chesapeake, and that low and marshy tract which divides the Chesapeake from Albemarle Sound. It is ascertained that a navigation for sea vessels, drawing eight feet of water, may be effected across the three last, and a canal is also believed to be practicable, not, perhaps, across the Isthmus of Barnstable, but from the harbor of Boston to that of Rhode Island. The Massachusetts Canal would be about twenty-six, the New Jersey about twenty-eight, and each of the two southern about twenty-two miles in length, making altogether less than one hundred miles.

Should this great work, the expense of which, as will hereafter be shown, is estimated at about three millions of dollars, be accomplished, a sea vessel entering the first canal in the harbor of Boston would, through the bay of Rhode Island, Long Island Sound, and the harbor of New York, reach Brunswick on the Raritan; thence pass through the second canal to Trenton on the Delaware, down that river to Christiana or Newcastle, and through the third canal to Elk River and the Chesapeake, whence, sailing down that bay and up Elizabeth River, it would, through the fourth canal, enter the Albemarle Sound, and by Pamlico, Core, and Bogue sounds, reach Beaufort and Swans-

borough in North Carolina. From the last-mentioned place, the inland navigation, through Stumpy and Toomer's sounds, is continued with a diminished draught of water, and by cutting two low and narrow necks, not exceeding three miles together, to Cape Fear River, and thence by an open but short and direct run along the coast is reached that chain of islands between which and the main the inland navigation is continued to St. Marys along the coast of South Carolina and Georgia. It is unnecessary to add any comments on the utility of the work, in peace or war, for the transportation of merchandise or the conveyance of persons.

The several papers under the letter A, herewith transmitted, contain the information which has been received on those several intended communications. The substance will now be stated.

I. Massachusetts Canal.

1. Sandwich Isthmus between Barnstable Bay on the north and Buzzards Bay on the south had first attracted the public attention. Surveys and levels were taken for the purpose of ascertaining the practicability of opening a cross cut to be supplied by the sea itself from the mouth of Back River in Buzzards Bay to the mouth of Scusset River in Barnstable Bay.

The distance was found to exceed seven miles; the elevation of the highest intermediate ground is forty feet above low water mark in Barnstable Bay; the depth of water at the mouth of Black River does not, at low water, exceed seven feet and a half, and the channel to that spot through Buzzards Bay is obstructed by shoals. The tide which rises but three feet and a half in that bay rises three hours and a half later, and more than eighteen feet in that of Barnstable. The shore on which that formidable tide would operate is an open beach without any harbor or shelter whatever. Independent of other obstacles, it was apprehended that the same natural causes which had formed the isthmus might fill the canal, or make a bar at its entrance, and the project seems to have been abandoned.

2. The ground was also examined between Barnstable Harbor on the north and Hyanus Harbor on the south at some distance east of Sandwich. The breadth of the peninsula does not exceed here four miles and a half, and there would be a harbor at each end of the canal. The same difference exists in the tides which rise four feet in Hyanus and sixteen feet in Barnstable Harbor. The entrance of this is obstructed by shoals, but the great obstacle to a cross cut is the elevation of the intermediate ground, estimated at eighty feet above tide water. Navigable ponds on that high ground might, perhaps, form part of a lock canal, and supply the remainder with water; but a canal, frozen in winter, would not have effected the great object in view, which was to enable vessels from sea to proceed in winter from Marthas Vineyard to Boston without sailing around Cape Cod. Although the difficulty of the navigation from Boston to Barnstable diminishes, the utility of this communication, as one of the great links in this line of inland navigation, it may be resorted to should that which will be next mentioned prove impracticable for sea vessel

3. The attention of the legislature of Massachusett-
authority the grounds at Sandwich and Barnstable ha

has lately been turned to a direct communication between Weymouth landing, within the harbor of Boston and Taunton River, which empties into the bay of Rhode Island. A favorable report has been made during the last session, of which a copy has lately been obtained. The distance from tide water to tide water is twenty-six miles by one route and twenty-three and a quarter miles by another. The highest intermediate ground is one hundred and thirty-three feet above tide water, but may be reduced ten feet by digging to that depth the length of a mile. Two ponds, known by the name of Weymouth and Cranberry, the largest and least elevated of which covers five hundred acres and is fourteen feet higher than the summit of the proposed canal, will supply the upper locks with water by feeders four miles long. Whether the quantity of water contained in those ponds, and estimated equal to a daily supply of 450,000 cubic feet, will be sufficient for a sloop navigation, and whether any other ponds or streams may be brought in aid, does not seem to be fully ascertained After descending twenty feet towards Weymouth and seventy towards Taunton an ample supply for the lower locks will be derived from other large ponds, the principal of which are known by the names of Braintree and Nippinitic. The expense may, on a supposition that the route is partly through a rocky soil, be estimated as follows:

Digging twenty-six miles, at $30,000 per mile	$780,000.00
Lockage, two hundred and sixty feet, at $1,250 a foot	325,000.00
Feeders, purchase of land, &c	145,000.00
	1,250,000.00

II. New Jersey Canal.

A company was incorporated some years ago by the legislature of New Jersey for opening a canal between the Raritan and the Delaware. Acting under the erroneous opinion that the navigation of small rivers might be improved and used as a canal, the company intended to have united, by a cross cut of one mile, the Assampink or Trenton Creek with Stony Brook, a branch of Millstone River, and to have descended Trenton Creek to the Delaware and Stony Brook and Millstone River to the Raritan. The capital, which was inadequate, was not paid; but their survey of the intended route has shown the practicability of a canal for sea vessels on a proper plan. The distance from Brunswick to Trenton is twenty-six miles, and the only obstacle on the way is the "sand hills," some distance west of Brunswick. These may, it is said, be avoided by a deviation which would not increase the distance more than two miles, and they may, at all events, be perforated as has been done by the turnpike company, who have opened a road on a straight line between the two towns without having in any place an angle of ascent of more than three degrees. The highest intermediate ground between Assampink and Stony Brook is only fifty feet above tide water, and it is suggested that the summit level may be taken seven feet lower, cutting seven miles through a level meadow between the confluence of the Assampink and Shippetankin creeks and Rowley's Mill, near the confluence of Stony Brook and Millstone River.

An adequate supply of water will be drawn by short feeders from Philip's Springs, Trenton Creek, Stony Brook, and Millstone River, all of which are more elevated than the route of the canal, the "sand hills" excepted.

The depth of water at the two extremities of the canal taken at low water are —— feet at Brunswick, and ten feet at Lamberton, one mile below Trenton.

The expenses may be estimated as follows:

Digging twenty-eight miles, at $20,000 per mile	$560,000.00
Lockage, one hundred feet (probably less), at $1,250 per foot	125,000.00
Feeders, purchase of land and water rights	115,000.00
	800,000.000

III. Delaware and Chesapeake Canal.

A company incorporated by the States of Delaware and Maryland for opening this canal has commenced its operations; now suspended for want of funds.

The canal will commence at Welsh Point, on Elk River, an arm of the Chesapeake, and terminate at a distance of twenty-two miles on Christiana Creek, a branch of the Delaware. At low water the depth of water in Christiana is nine feet, and in Elk twelve feet, within one hundred feet from the shore. The tide rises four feet in both rivers. The canal might, without increasing the distance, be conducted to Newcastle on the Delaware itself, instead of ending on Christiana Creek.

The highest intermediate ground over which the canal will be carried on a level of thirteen miles in length is seventy-four feet above tide water, the descent being effected by nine locks on each side. The digging is generally easy, no expensive aqueducts or bridges, nor any other obstacle but those which have already been overcome in digging the feeder through a very rocky soil.

The supply of water drawn from Elk River by a feeder six miles in length, already completed, which is itself a boat canal three feet and a half deep, united by a lock of ten feet lift with the main canal, is calculated to fill daily one hundred and forty-four locks, a quantity sufficient on an average for the daily passage of twenty-four vessels. A reservoir covering thirty, and which may be increased to one hundred and fifty, acres will supply occasional deficiencies. Other reservoirs may be added, and Christian, White, and Clay creeks may hereafter be brought in aid of Elk River if the supply should prove too scanty for an increased navigation.

The canal twenty-six feet wide at the bottom and fifty on the top on the water line, being dug at the depth of eight feet, is intended for vessels of forty to seventy tons, drawing seven and a half feet water; but the banks, twenty feet wide for towing paths and one of which may be converted into a turnpike road, being raised three feet above the level of the water, will, by increasing the height of the lock-gates one foot, admit a depth of nine feet of water in the canal, at which depth it would perhaps be eligible to dig at once. The locks, eighty feet long, eighteen feet wide, and eight or nine feet deep over the gate-sills, containing each eleven thousand five hundred to thirteen thousand cubic feet of water and with a lift of eight to nine feet each, will be constructed of hewn stone laid in tarras. Those dimensions, both of the canal and locks recommended by Mr. Latrobe, the engineer of the canal, may be adopted in all the other canals for sea vessels on this line of communication.

The present annual carriage across the peninsula, which would be drawn through the canal, is estimated at forty-two thousand tons, exclusively of passengers. This will be greatly increased by the facility which the canal itself will afford to the commercial intercourse between the two bays and to the conveyance of articles now carried through other channels, or too heavy for transportation at the present expense of carriage. The coals wanted for Philadelphia, and which, brought down from the sources of the Susquehannah and Potomac, but principally from the vicinity of Richmond, would naturally pass through the canal, have been alone estimated at more than one hundred thousand tons a year. The annual carriage of all articles may, in the present state of population, be fairly estimated at one hundred and fifty thousand tons, and the direct annual saving to the community at $300,000; being at the rate of two dollars a ton for the difference between land and water carriage across the peninsula, after paying the tolls. These, at the rate of fifty cents a ton, will give to the undertakers a revenue of $75,000, leaving, after a deduction of $10,000 for annual repairs and of $10,000 more for attendance and contingencies, a net income of $55,000.

The expenses of the whole work are estimated as follows:

Digging twenty-two miles, at $20,000 a mile	$440,000.00
Eighteen locks, at $10,000 each	180,000.00
(The whole lockage, being one hundred and forty-eight feet, would, at $1,250 a foot, amount to $185,000.00.)	
Feeder, (nearly completed) reservoirs, lock at the feeder, purchase of water rights and land, including a debt of —— dollars, due by the company	230,000.00
	850,000.00

The interest on which sum at 6 per cent is $51,000.

The capital originally subscribed amounted to $400,000, divided into two thousand shares of two hundred dollars each. One-half of these has been forfeited, after a small payment of five dollars on each share; $100,000 paid by the other stockholders have been expended in preparatory measures in the purchase of water rights and in digging the feeder, which was considered as the most difficult part of the work; $750,000 are still wanted to complete the work, of which sum $100,000 are payable by the stockholders, and the deficiency of $650,000 must be drawn from other sources.

IV. Chesapeake and Albemarle.

1. The shortest communication between the Chesapeake and Albemarle Sound is from North Landing, at the head of the tide of Northwest River, which empties into Currituck Inlet, the easternmost arm of Albemarle to either Kempsville or Great Bridge, at the head of the tide of two different branches of the south branch of Elizabeth River, which, passing by Norfolk, unites at Hampton Roads with James River and the Chesapeake. The distance is stated at seven miles, and the levels said to be favorable. It is believed that the principal reason why this communication has not been attempted is a bar in Currituck Inlet which does not admit the passage of vessels drawing five feet water.

2. A company incorporated by the States of Virginia and North Carolina for opening a canal through the Dismal Swamp has made considerable progress in the work.

The canal extends twenty-two miles in length from Deep Creek, a branch of the south branch of Elizabeth River, seven miles above Norfolk to Joyces Creek, a branch of Pasquotank River, a northern arm of Albemarle Sound. Vessels drawing eight to nine feet water may ascend both creeks to each extremity of the canal.

The intervening ground along the eastern margin of the Dismal Swamp is almost level, the rise towards the middle not exceeding two feet above the two extremities, which are only eighteen feet and nine inches above tide water. The digging is very easy; the only obstacles arise from the stumps and roots of trees, and are nearly overcome; and a single aqueduct or, rather, culvert over a small run emptying into the Northwest River is necessary.

The swamp itself supplies at the depth at which the canal is cut the water which has heretofore been wanted, and a sufficient supply may be drawn by a feeder of three miles and a half in length, cut through a perfect level from Lake Drummond, a natural reservoir in the center of the swamp of fifteen miles in circumference and about six feet higher than the water in the canal.

The canal as cut by the company is twenty-four feet wide and six feet deep, with one bank on the west side for a towing path eighteen feet broad. The whole digging, with the exception of two miles, which must be deepened three feet, and of three-quarters of a mile in another place not entirely finished, has been completed. The locks at the two extremities of the canal are not built, but two have been erected at some distance from each extremity, probably in order to save some digging in the intervening space; they are made of square juniper logs and have cost only three hundred dollars each.

The expense of digging has not exceeded four thousand dollars a mile; the whole capital expended amounts to one hundred thousand dollars, of which the State of Virginia has furnished seventeen thousand five hundred; and it is stated that the whole work may be completed in one year, and will not, including the locks and the payment of some debts contracted by the company, exceed twenty-five thousand dollars. But the canal which by the original act of incorporation was to be thirty-two feet wide and eight feet deep, can, on its present plan, be considered only as a local object, the principal utility of which consists in bringing to market the otherwise useless lumber of the swamp. The only boats which navigate it are flats, forty feet long, six feet wide, drawing two feet of water, and carrying eight thousand shingles.

It must, in order to become a national object, be capable of receiving vessels which navigate Albemarle Sound, and for that purpose be restored to its first intended dimensions, or rather be widened and deepened on the plan adopted for the Chesapeake and Delaware Canal. The expense would be as follows:

Digging, viz, deepening to 8 feet, preserving the same level the whole way, and widening to a proper breadth, 22 miles, at eight thousand dollars a mile	$176,000.00
Four stone locks, at ten thousand dollars	40,000.00
Feeder to Lake Drummond, aqueduct, and contingencies	34,000.00
	250,000.00

3. The last-mentioned canal is in the most direct line of the communication through Albemarle to Pamlico Sound and the adjacent southern sounds. It has been objected that the navigation of Pasquotank River was intricate, and that it would be more advantageous to open a communication with Chowan River, which, passing by Edenton and then uniting with the Roanoke, forms Albemarle Sound.

A company was incorporated for that purpose, but the capital was not filled, and no other operation performed but surveying the ground. The intended canal on that route would commence at Suffolk on Nansemond River, which empties into James River a few miles above and west of the mouth of Elizabeth River, and passing along the western margin of the Dismal Swamp would reach, at a computed distance of thirty miles, Gates Court House on Bennets Creek, a branch of Chowan River, which vessels drawing ten feet of water may ascend to that spot.

The highest intermediate ground is twenty-eight feet above tidewater, and, consequently, higher than the surface of Lake Drummond. But Bennets Creek and Curripeake Swamp were considered as affording a sufficient supply of water. Should this prove adequate the principal objection to this route will be that the canal lands at Suffolk instead of Norfolk. This consideration and the capital already expended on the canal from Elizabeth River to Pasquotank seem to give a preference to this course. To which may be added, that if it be preferable to strike the waters of Chowan River a lateral canal may be hereafter opened along the southern margin of the Dismal Swamp, from the southern extremity of the Elizabeth and Pasquotank Canal to Bennets Creek or Edenton. Whatever route may, after a critical examination of the ground, be thought the most eligible, the opening of this communication will be more easy and less expensive than either of the three northern canals.

The following table is a recapitulation of the distance to be cut on the whole line and of the estimated expense:

Canals.	Direction.	Distance.	Lockage.	Expense.
		Miles.	*Feet.*	
Massachusetts Canal	Weymouth to Taunton	26	260	$1,250,000.00
New Jersey Canal	Brunswick to Trenton	28	100	800,000.00
Delaware and Chesapeake Canal	Christiana to Elk	22	148	750,000.00
Chesapeake and Albemarle Canal	Elizabeth River to Pasquotank.	22	40	250,000.00
Total		98	548	3,050,000.00

COMMUNICATIONS BETWEEN THE ATLANTIC AND WESTERN WATERS.

The Appalachian Mountains, to use an ancient generic denomination, extend in a direction west of south, from the 42d to the 34th degree of north latitude, approaching the sea, and even washed by the tide in the State of New York, and thence in their southerly course gradually receding from the seashore. Viewed as a whole, their breadth may be estimated at one hundred and ten miles, and they consist of a succession of parallel ridges following nearly the direction of the seacoast, irregularly intersected by rivers and divided by narrow valleys. The ridge which divides the Atlantic rivers from the western waters, generally known by the name of Allegany,

preserves throughout a nearly equal distance of two hundred and fifty miles from the Atlantic Ocean and a nearly uniform elevation of three thousand feet above the level of the sea.

Those mountains may, however, be perhaps considered as consisting of two principal chains; between these lies the fertile limestone valley, which, although occasionally interrupted by transversal ridges, and in one place by the dividing or Allegany ridge, may be traced from Newburgh and Esopus on the Hudson River to Knoxville on the Tennessee.

The eastern and narrowest chain is the Blue Ridge of Virginia, which in its northeast course traverses, under various names, the States of Maryland, Pennsylvania, and New Jersey, forms the high lands broken at West Point by the tide of the Hudson, and then uniting with the Green Mountains, assumes a northerly direction and divides the waters of the Hudson and Lake Champlain from those of Connecticut River. On the borders of Virginia and North Carolina the Blue Ridge is united by an inferior mountain with the great western chain, and thence, to its southern extremity, becomes the principal or dividing mountain, discharging eastwardly the rivers Roanoke, Pedee, Santee, and Savannah into the Atlantic Ocean; southwardly, the Chatahoochee and the Alabama into the Gulf of Mexico, and, westwardly, the New River and the Tennessee. The New River, taking a northwardly course, breaks through all the ridges of the great western chain, and at a short distance beyond it unites, under the name of Kanawha, with the Ohio. The Tennessee pursues at first a southwest direction between the two chains until having reached, and in a westwardly course turned, the southern extremity of the great western chain, it assumes a northwardly direction, and joins its waters with those of the Ohio a few miles above the confluence of that river with the Mississippi.

The western chain, much broader, and generally more elevated, is known under the name of Cumberland and Gauley mountains from its southern extremity near the great bend of the Tennessee River until it becomes in Virginia the principal or dividing mountain; thence, in its northerly course, towards the State of New York, it discharges westwardly the Green Briar River, which, by its junction with the New River, forms the Kanawha and the rivers Monongahela and Allegany, which, from their confluence at Pittsburg, assume the name of Ohio. Eastwardly it pours into the Atlantic Ocean, James River, the Potomac, and the Susquehannah. From the northernmost and less elevated spurs of the chain the Genesee flows into Lake Ontario; and in that quarter the northerly branches of the Susquehannah seem to take their source from amongst inferior ridges, and, in their course to the Chesapeake, to break through all the mountains. From the Susquehannah the principal chain assumes a more eastwardly direction, and washed on the north by the lateral valley of the river Mohawk, whilst it gives rise southwardly to the Delaware, it terminates under the name of Catskill Mountain, in view of the tide water of the Hudson.

This description has been introduced for the double purpose of pointing out all the rivers which can afford the means of communication and of showing the impracticability, in the present state of science, of effecting a canal navigation across the mountains.

The most elevated lock canal of which a correct description has been given is that of Languedoc; and the highest ground over which it is carried is only six hundred feet above the sea. It is not believed that any canal has been undertaken, or at least completed in England, of an elevation exceeding four hundred and thirty feet above the waters united by it. The Allegany Mountain is generally, and from observations made in several places, about three thousand feet above the level of the sea. The precise height of the dividing ridge was ascertained by the commissioners who laid out the United States road from Cumberland on the Potomac to Brownsville on the Monongahela, at two thousand two hundred and sixty feet above the first, and at two thousand one hundred and fifty feet above the last river. Cumberland, from the levels taken by the Potomac Company, is itself seven hundred and thirty-five feet above tide water. Although some more advantageous and less elevated places may be found, particularly amongst the ridges which divide some of the upper branches of the Susquehannah from the corresponding streams emptying into the river Allegany, there is none which is not of an elevation much beyond what has ever been overcome by canals in any other country. The impracticability arises from the principle of lock navigation, which, in order to effect the ascent, requires a a greater supply of water in proportion to the height to be ascended, whilst the supply of water becomes less in the same proportion. Nor does the chain of mountains through the whole extent where it divides the Atlantic from the western rivers afford a single pond, lake, or natural reservoir. It may be added as a general feature of American geography that except in the swamps along the southern seacoast no lake is to be found in the United States south of 41° north latitude and that almost every river north of 42° issues from a lake or pond.

The works necessary in order to facilitate the communications from the sea-ports across the mountains to the western waters must, therefore, consist either of artificial roads extending the whole way from tide water to the nearest and most convenient navigable western waters; or of improvements in the navigation of the leading Atlantic rivers, to the highest practicable points, connected by artificial roads across the mountains, with the nearest points from which a permanent navigation can be relied on down the western waters.

The principal considerations in selecting proper directions for those communications are the distance from the navigable western waters, both to tide water, and to the nearest navigable Atlantic river, and the extent of navigation, either natural or susceptible of improvement, which may be afforded by the rivers; distance alone is mentioned, so far as relates to roads, because the mountains, however insuperable for canals, offer no important impediment to land communications. So far from being an insurmountable barrier to commercial intercourse between the two great sections of the Union, it is now ascertained that those mountains may, almost in every direction, be crossed by artificial roads as permanent, as easy, and less expensive than similar works in the lower country; for Congress having, contrary to current opinion, directed that the road from Cumberland to Brownsville should be laid out so that its ascent should not in any place exceed an angle of five degrees with the horizon, no

difficulty has been experienced in effecting the object without cutting through hills; and, although the road thus laid out be, in a distance of seventy-two miles, two or three miles shorter than that heretofore in use.

Although the distance from the sea to the principal dividing mountain, through its whole length, between the western sources of the Susquehannah and those of the Savannah, be nearly the same, yet the Atlantic bays penetrating the coast at different depths and in different directions, the distance from the seaports to the nearest western navigable waters varies considerably. Taken in straight lines from each port to the nearest branch, beyond all the mountains of each of the four great western rivers, they may be stated as follows:

	Miles
From Philadelphia to the confluence of Conemaugh and Loyalhannon, branches of the Allegany	220
From the city of Washington to the confluence of the rivers Monongahela and Cheat	150
From Richmond to Morris's on the Kanawha, below all the falls of that river	210
From Savannah or Charleston to any navigable branch of the Tennessee, the distance exceeds	300

The distance from the same western points to the upper navigation of the corresponding Atlantic rivers can not be stated with precision, as the upper points, to which the navigation of these rivers may be improved, are not yet ascertained. The shortest portage between the waters of the Potomac and those of the Monongahela, in their natural state, from West Point on the Potomac to Cheat River below the falls, is about fifty miles in a straight line; but, in order to secure a tolerable navigation, particularly on the Potomac, the route from Cumberland to Brownsville (Red Stone Old Fort) has been preferred, and the distance by the road lately laid out is seventy-two miles. The portage between the north fork of the Juniata, a branch of the Susquehannah, and the corresponding waters of the river Allegany is somewhat shorter. That between Pattonborough, on James River, and the falls of the Kanawha, exceeds one hundred miles.

The most prominent, though not perhaps the most insuperable obstacle in the navigation of the Atlantic rivers, consists in their lower falls, which are ascribed to a presumed continuous granite ridge, rising about one hundred and thirty feet above tide water. That ridge from New York to James River inclusively arrests the ascent of the tide; the falls of every river within that space being precisely at the head of the tide; pursuing thence southwardly a direction nearly parallel to the mountains, it recedes from the sea, leaving in each southern river an extent of good navigation between the tide and the falls. Other falls of less magnitude are found at the gaps of the Blue Ridge, through which the rivers have forced their passage. Higher up, the rapidity of the northern rivers, which penetrates through the inferior ridges of the great western chain, increases as they approach the dividing or Allegany Mountain, and their sources being nearly at the same elevation, their rapidity increases in proportion to the shortness of their course. For that reason the navigation of the Susquehannah, above the Blue Ridge, is better than that of the Potomac, which affords, as has been stated, the shortest communication from tide water to the nearest western river. The levels

of the last mentioned river having been taken by the Potomac Company, the general result is annexed, as giving a more correct idea of the navigation of the Atlantic rivers than could be conveyed in any other manner:

	Distance.	Fall.	Rate of fall.
	Miles.	*Feet.*	*Feet per mile.*
From the mouth of Savage River down to Cumberland	31	445	14¼
Thence to the Blue Ridge	130¼	490	4
Harpers Ferry or Shenandoah Falls	5½	43	.....
Thence to Great Falls	40	39	1
Great and Little Falls to tide water	12	143	.....
Total	219	1,160	.....

The papers, marked C, contain the information which has been collected respecting the works executed or contemplated on the great rivers already enumerated. It has not been understood that any improvements of importance had been yet attempted on the Savannah and Pedee, nor on any of the tributary streams of the Ohio; and the communications received under this head relate only to the Santee, Roanoke, James River, Potomac, Susquehannah, and Ohio.

I. Santee.

The Santee or Catawba is said to be occasionally navigable for near three hundred miles as high up as Morgantown, in North Carolina. Two companies have been incorporated by that State and the State of South Carolina, for the purpose of improving its navigation. The Lower Falls are above Camden, and not far from the arsenal of the United States at Mount Rock. A canal had been commenced there, but, either from want of success in the commencement, or from want of funds, the work appears to be suspended. The market for the produce brought down that river is Charleston; and the river boats were obliged, at the mouth of the river, to enter the sea, and to reach that port by a navigation along the seashore for which they were not calculated. To remedy that inconvenience, and to ensure a permanent navigation, a canal has been opened by another company, uniting the Santee with Cooper River, which empties into the harbor of Charleston.

The distance between the points united is twenty-two miles; the highest intervening ground was fifty-two feet above the Santee, and eighty-five feet above the river Cooper; but it has been reduced seventeen feet by digging. The descent to Santee being thirty-five feet, effected by four locks, and that to Cooper sixty-eight feet, effected by nine locks.

The principal supply of water is afforded by springs arising from the marshy ground at the bottom of the canal, and by several drains which collect and bring from an adjacent swamp the sources of the river Cooper. The quantity is said to be seldom deficient; yet a steam engine has been contemplated as perhaps necessary in order to raise from the Santee an adequate supply.

The canal was carried over some small streams by means of aqueducts; inconsiderable ravines have been filled, and the ground was dug in some places to the depth of sixteen feet in order to preserve

the level. But it appears that the roots of trees were the greatest obstacle encountered in digging the canal. Its breadth is twenty feet at the bottom, and thirty-five feet at top; the depth of the water is four feet, and it admits boats of twenty tons. The locks made of brick, faced with marble, are sixty feet long and ten feet wide.

The capital expended is stated at $650,667, including sixty negroes and some tracts of land belonging to the company. The canal has been completed six years; the annual tolls had never exceeded $13,000 before the year 1807, and the annual expenses are stated at $7,000. The want of success in this undertaking, which, though completed, is very unprofitable, may be ascribed to several causes. The expense, compared with the work, is much greater than might have been expected, and probably than was necessary. The locks are too small for large boats, which are therefore obliged to pursue the former route down the Santee, and by sea to Charleston; and the want of water is alleged as a sufficient reason for the size of the locks. But a canal in that situation can not, in America, be profitable, unless the navigation of the main river with which it communicates is rendered safe and permanent; and whenever that of the Santee itself shall have been improved, the utility and profits of the canal will be considerably increased.

II. The Lower or Great Falls of Roanoke.

Consist in a succession of rapids, which, in a distance of fifteen miles, have a fall of ninety-three feet. This obstruction is such that almost all the tobacco of that river is transported by land to Petersburg, on the Appomatox branch of James River. A canal has been contemplated from the upper end of the falls to Murfreesborough, situated on the tide water of a branch of Chowan River, twenty-five miles above the mouth of Bennets Creek, which has been before mentioned as one of the lines of communication between Albemarle Sound and the Chesapeake. The level is said to be favorable without any obstructions or valleys in the way. The distance is thirty-eight miles, and the expense of a small canal for boats drawing two feet and a half of water may be estimated as follows:

Digging thirty-eight miles, at $6,000 a mile	$228,000
Lockage ninety-three feet, at $800 a foot	74,400
Feeder, land, &c	47,600
	350,000

The capital for this canal has never been subscribed, and it has been suggested that it would be practicable to open one to Petersburg. It is not believed that any hills intervene in that course; and the greatest obstacle will be found in crossing the branches of Chowan River.

III. James River.

A company incorporated by the State of Virginia for the improvement of the navigation of the river generally has removed some obstructions in the upper part of the river, and is bound by the charter to render it so far navigable that there may never be less than twelve inches of water over any of the shoals or rapids, from the upper end of the Lower or Great Falls to Pattonborough, a distance of two hundred and twenty miles. The natural navigation of the river through

that extent is considered as better than that of any other Atlantic river above the falls.

A communication has been opened by the company from Westham, at the upper end of the Great Falls, to Shockoe Hill, in the city of Richmond, in the following manner: The water is drawn at Westham from the river into a canal two hundred yards in length, at the end of which boats descending thirty-four feet through three locks reenter the river, and, after using its natural navigation three miles, are brought by a canal three miles and a half in length to a basin on Shockoe Hill, where the navigation terminates

That basin is about eighty feet above tide water, and one mile and a half from Rockets, the port of Richmond. The whole fall from the upper end of the canal at Westham to the basin may be stated at forty-eight feet, and the distance at six miles and a half. The canal is twenty-five feet wide, and admits boats of eight tons drawing three feet water. The locks, eighty feet long and sixteen feet wide, are of solid masonry; but the cement is defective. The aqueducts have been thrown across valleys intervening in the course of the canal, and some difficult digging was necessary on the side of the hills and through ledges of rocks.

The canal, according to the charter, was intended to have been brought down to tide water. The performance of that condition is now suspended by an act of the legislature of Virginia, and there seems to be a considerable diversity of opinion on that subject. In a national point of view, the plan which will, at the least expense, put coals on board vessels lying at Rocket's, deserves the preference. For coal is in no other parts of the United States found in abundance in the vicinity of tide water. At present the expense of transportation by the canal is already reduced to one-third of the land carriage.

The original capital of the company amounted to $140,000, of which the State of Virginia owns $50,000, and $91,000 arising from the proceeds of tolls had, before the 1st of January, 1805, been applied to the work, making together an expenditure of $231,000. The annual tolls raised on fourteen thousand tons of country produce, and on two thousand coal boats, have amounted to $16,750; and the annual repairs and expenses are estimated at $5,000. But as the company draw also a revenue from the rent of water, applied to mills and other waterworks erected along the canal, they have been able in some years to make dividends of $16,800, being at the rate of twelve per cent on the original capital, but of only about seven per cent if calculated on the sum of $244,000, the amount of capital expended, and interest accrued before any dividend was made.

IV. Potomac.

The company incorporated by the States of Maryland and Virginia for improving the navigation of that river has executed the following works:

1. At a distance of twelve miles above the head of the tide which ascends about three miles above the city of Washington, the river is one hundred and forty-three feet higher than tide water. At that place, designated by the name of *Great Falls*, the boats passing through a canal one mile in length, six feet deep, and twenty-five feet wide, descends seventy-six feet by five locks, one hundred feet long,

and twelve feet wide each, and re-entering the river, follow its natural bed eight miles and a half. Another canal, of the same dimensions, and two miles and a half in length, brings them then through three locks, and by a descent of thirty-seven feet to tide water. This last fall is distinguished by the name of *Little Falls*. The two lower locks of the Great Falls, excavated out of the solid rock, have each a lift of eighteen feet; the three upper locks of solid masonry are of unequal height, and have, together, a lift of forty feet. The three locks of the Little Falls are each one hundred feet in length, and eighteen feet wide. That breadth is unnecessary, and consumes too much water, a defect which will be remedied when stone locks will be substituted to those now in use, which, being of wood, will soon be decayed.

Three other canals without locks have been opened around three distinct falls: The principal at the Shenandoah Falls, below Harper's Ferry; and at the place where the Potomac breaks through the Blue Ridge is one mile in length around a fall of fifteen feet. Between this and the Great Falls another canal three-fourths of a mile in length is opened around the Seneca Falls. The third, fifty yards in length, has been cut around Houres Falls, five miles above the Shenandoah Falls. Above this place the navigation has been improved by deepening occasionally the channel, raising the water in shallow places by small dams, and opening sluices along the shore. It is believed that, by multiplying the number of those low dams, by throwing the channel along the shore, and when necessary opening canals with or without locks around the principal rapids, the navigation may be improved perhaps as high up as Cumberland, one hundred and eighty-eight miles above tide water, to such a degree as to render the river passable for boats the greater part of the year. And if this be found practicable on the Potomac, which is the most rapid of the great Atlantic rivers, the same improvements may, with greater facility, be effected on any of the others. It will be indispensable in order to attain that object on the Potomac, that additional canals with locks should be opened at the Shenandoah or Blue Ridge Falls, which, as has already been stated, fall forty-three feet in the distance of five miles.

2. The Shenandoah, a river nearly as large as the Potomac itself, after a course of two hundred and fifty miles through the great Limestone Valley, unites its waters with those of the Potomac at Harpers Ferry, just above the Blue Ridge. From Port Republic, till within eight miles of the Potomac, a distance of near two hundred miles, it affords a good navigation, the fall of the river being at the rate of less than two feet a mile. In the last eight miles it falls eighty feet, and was impassable before the improvements completed last year by the Potomac company. Six different canals twenty feet wide, four feet and a half deep, and extending altogether two thousand four hundred yards, have been opened around the most difficult falls. Through those and five stone locks one hundred feet long and twelve feet wide each, and effecting together a descent of near fifty feet, the communication is now opened, and will render the undertaking much more productive than heretofore. The water in all those canals and locks, as well as in those executed on the Potomac, is uniformly supplied by the river itself.

The capital originally subscribed amounted to $311,560, divided into seven hundred and one shares, of which the State of Maryland owns two hundred and twenty, and the State of Virginia seventy. The total amount expended, including an additional payment received from late subscribers, $38,000, arising from tolls which have been applied to the work, and a debt of about $67,000 contracted by the company, amounts to $444,652. The annual tolls raised on eight thousand tons of sundry articles, valued at more than half a million of dollars, have not before the opening of the Shenandoah exceeded $15,000; and the annual expenses and repairs are stated at $5,000. One hundred shares of £145 sterling each remain open for subscription.

V. Susquehannah.

This river has no perpendicular or altogether impassable falls; but, from the head of the tide up to the Pennsylvania line, a distance of ten miles, the navigation is impeded by a succession of dangerous rapids; and these, though occasionally separated by sheets of smooth water, continue forty miles higher up, at least as far as Columbia; the whole fall from this place to the head of the tide being estimated at about one hundred and forty feet. The navigation, through that distance, at all times dangerous, is practicable only during the high freshets, when rafts and flat bottomed boats, eighty feet long and seventeen feet wide, may descend from the several widely extended upper branches of the river. Less dangerous falls are found at the place where it breaks through the Blue Ridge; above which the natural navigation from Middletown upwards, whether up the Juniata, the West Branch, or the East Branch, is much better than that of the Potomac, and has been improved in several places at the expense of the State of Pennsylvania. A canal one mile long and four feet deep, with two brick locks, has also been opened around the Conewago Falls in the gap of the Blue Ridge, $14,000 having been paid for that object by the same State. Its entrance is difficult, and it is used for water works, being free for navigation, through private property. From Columbia down to the Maryland line considerable improvements in the bed of the river have also been made at the expense of the two States, and the descending navigation has, on the whole, been improved; but few boats ever attempt to ascend. Nor is it believed that the natural advantages of the most considerable Atlantic river will ever be fully enjoyed until a canal shall have been opened the whole way from Columbia, either to tide water or to the Delaware and Chesapeake Canal.

A company incorporated by the State of Maryland for opening a canal around the falls in that part of the river which extends from the Pennsylvania line to tide water, has completed that part of the work, the utility of which is but very partially felt, whilst the bed of the river remains the only communication from its upper extremity up to Columbia.

The canal, thirty feet wide and three feet deep, and admitting boats of twenty tons, is nine miles in length, with a fall of fifty-nine feet. The descent is effected by eight stone locks, each of which is one hundred feet in length and twelve feet wide. The water is supplied by the river itself; and, in order to cross the rivers Conawingo and Octorara, these, by means of dams, have been raised ten and twelve feet to the level of the canal.

Its defects consist in the want of sufficient breadth of the locks, which do not admit the rafts and wide flat bottomed boats generally used in bringing down the country produce, and in want of water at the lower end of the canal. This last defect may be remedied by extending the canal seven hundred yards lower down along the edge of the river; and it is probable that as timber will become more scarce and valuable in the upper branches of the Susquehannah, boats of a different construction will be used. In the mean time the annual tolls have not yet amounted to $1,000, whilst the annual expenses are stated at $1,200, and the capital expended at $250,000.

The attempts made to open a communication from Middletown, in the Limestone Valley, to Philadelphia, partly by canals, and partly by means of the Schuylkill, will be noticed under the head of "Interior Canals."

VI. OHIO.

The navigation of the Kanawha and of the eastern branches of the Tennessee, Monongahela, and Allegany, in their course through the mountains, may at a future period be improved. But, from the foot of the mountains, all those rivers, and particularly the Ohio, flow with a much gentler current than the Atlantic rivers, a circumstance easily accounted for when it is recollected that Brownsville, on the Monongahela, and at a distance of two thousand miles by water from the sea, is only one hundred and fifteen feet more elevated than Cumberland, on the Potomac; whilst this river, with all its meanders, reaches tide water within less than two hundred miles. All those rivers at the annual melting of the snows rise to the height of more than forty feet, affording from the upper points to which they are navigable a safe navigation to the sea for any ship that can pass over the bar at the mouth of the Mississippi. As early as the year 1793, a schooner built on the Monongahela, between Brownsville and Pittsburg, reached New Orleans by that extraordinary inland navigation, and arrived safely at Philadelphia. This first essay stimulated the spirit of enterprise so conspicuous in the American character, and numerous vessels, from one hundred to three hundred and fifty tons burden, are now annually built at several shipyards on the Ohio, even as high up as Pittsburg, and bringing down to New Orleans the produce of the upper country consumed there, carry to Europe and to the Atlantic ports of the United States the cotton, the sugar, and the tobacco of Louisiana and of the States of Tennessee and Kentucky.

That branch of national industry gives value to the immense forests of the Ohio and of its numerous branches, and will soon make a considerable, and perhaps necessary, accession to the shipping of the United States, and has a tendency to diminish the price of freights from New Orleans to the other American and to foreign ports. The importance of this last consideration will be duly felt, if the magnitude of the exports of which New Orleans is destined to be the emporium, be contrasted with the probable amount of its importations; for such are the labor, time, and expense necessary to ascend the rapid stream of the Mississippi, (and the nature of its banks, annually overflowed on a breadth of several miles, precludes the possibility of towing paths,) that, whilst the greater part of the produce of the immense country, watered by that river and its tributary streams, must necessarily be

exported through its channel, the importations of a considerable portion of that country will continue to be supplied from the Atlantic seaports, by water and land communications, susceptible of considerable improvement; and thus, unless another outlet be found for a portion of the exports, or unless the upper country can supply vessels, those exports must necessarily pay a double freight.

The only impediments to that navigation are on the Tennessee, "the Muscle Shoals," of which no particular account has been received, and on the Ohio, the falls of Louisville. Ordinary boats can with difficulty pass these in summer, and the navigation is, even during the freshets, dangerous for the large vessels. The attention of the legislature of Kentucky, and of the inhabitants of the western country, generally, has, therefore, been particularly drawn to the opening of a canal at that place. A company has been lately incorporated by the State of Kentucky for that purpose, with a capital which may amount to $500,000, but a small portion of which has yet been subscribed. The expense, however, is estimated at a sum less than the nominal capital.

The proposed canal would be near two miles in length, and must be dug, in some places, to a depth of twenty-seven, but generally about sixteen feet. The breadth at the bottom being twenty feet, with the necessary slope, would make it, generally, sixty-eight feet wide at top, and, in particular places, not less than one hundred. The fall at low water is about twenty-two feet, and would require three locks, of dimensions sufficient to pass ships of four hundred tons, and drawing fourteen feet of water. The greatest expense will be that of digging, and removing the earth, which may be estimated at four hundred thousand cubic yards, and, according to the representation made of the nature of the ground, will not probably cost more than $200,000. To this may be added $100,000 for the locks and other necessary works, making, altogether, $300,000. The greatest difficulty seems to be the protection of the locks and canals against the rise of the river, which sometimes overflows the whole ground through which the canal must be opened.

The expense of the improvements suggested in the communications between the Atlantic and western waters may be stated as follows:

1st. Four artificial roads from the four great western rivers, the Allegany, Monongahela, Kanawha, and Tennessee, to the nearest corresponding Atlantic rivers, the Susquehannah or Juniata, the Potomac, James river, and either the Santee or Savannah, leaving to the several States the continuation of those roads eastwardly to the nearest seaports. Those roads should unite on each river points from which a permanent and safe navigation downwards could, except during the driest season, be relied on; and will, therefore, on each route, be estimated at one hundred miles, making, altogether, four hundred miles, which, at $7,000 a mile, the materials being generally on the spot, would cost....	$2,800,000
2dly. The improvement of the navigation of the four Atlantic rivers, from tide water to the highest practicable point, effected, principally, by canals around the falls wherever practicable, and by locks wherever necessary. The most expensive of these would be the proposed canal from Columbia, on the Susquehannah, either to tide water or to the Delaware and Chesapeake canal; and, considering how much has been effected already, and may still be done on the other rivers, by the several incorporated companies, it is believed that every useful improvement might be completed by a public expenditure not exceeding.....	1,500,000
3dly. The canal at the falls of the Ohio, estimated at.....	300,000
	4,600,000

Although a canal navigation, uniting the Atlantic and western waters in a direct course across the mountains, appears impracticable, yet those mountains may be turned either on the north, by means of the Mohawk Valley and of Lake Ontario, or on the south, through Georgia and the Mississippi territory. The first communication will be noticed under the head of "The River St. Lawrence and Great Lakes." Of the second it will be sufficient to observe that the country lying between the sources of the rivers Chatahoochee and Mobile and the Gulf of Mexico is an inclined plane, regularly descending towards the sea, and that, by following the proper levels, it presents no natural obstacle to the opening of a canal fed by the waters of the two last-mentioned rivers and extending from the tide water on the coast of Georgia to the Mississippi. The distance, in a direct line, is about five hundred and fifty miles, and, to be overcome, requires only time, perseverance, and labor. When it is recollected that such an undertaking would discharge the Mississippi into the Atlantic, the remarks already made on the trade of that river and other obvious considerations will sufficiently point out its immense importance. Nor should the plan, on account of its magnitude, be thought chimerical; for the elevation and other natural obstacles of intervening ground, or want of a sufficient supply of water, and not distance, are the only insuperable impediments to an artificial navigation.

This work, which is presented, not as an immediate, but as a distant object, worthy of consideration, would probably require ten millions of dollars and thirty years for its completion. The annual sales of the public lands in the Mississippi territory, which are estimated at fifty millions of acres, would, after paying the debt due to the State of Georgia, afford sufficient funds; and the increased value of the residue would alone more than compensate the expense.

It is proper to add that an inland navigation, even for open boats, already exists from New Orleans, by the canal Carondelet, to the lake Pontchartrain, thence, between the coast and the adjacent islands, to the bay of Mobile, and up its two principal rivers, the Alabama and the Tombigbee, to the head of the tide, within the acknowledged boundaries of the United States. The current of these two rivers being much less rapid than that of the Mississippi, they have long been contemplated, particularly the Tombigbee, as affording a better communication to the ascending or returning trade from New Orleans to the waters of the Tennessee, from which they are separated by short portages.

COMMUNICATIONS BETWEEN THE ATLANTIC RIVERS AND THE RIVER ST. LAWRENCE AND GREAT LAKES.

Vessels ascend the river St. Lawrence from the sea to Montreal. The river Sorel discharges at some distance below that town the waters of Lake George and Lake Champlain, which penetrate southwardly within the United States. From Montreal to Lake Ontario the ascent of the river St. Lawrence is estimated at about two hundred feet. From the eastern extremity of Lake Ontario, an inland navigation for vessels of more than one hundred tons burthen, is continued for more than one thousand miles, through Lakes Erie, St. Clair, and Huron, to the western and southern extremities of Lake Michigan,

without any other interruption than that of the falls and rapids of Niagara, between Lake Erie and Lake Ontario. The descent from Fort Schlosser to Devils Hole, a distance of four miles, which includes the perpendicular falls of Niagara, has, by correct measurement, been ascertained at three hundred and seventy-five feet. The whole fall from Lake Erie to Lake Ontario is estimated at four hundred and fifty feet, making the elevation of Lake Erie above tide water six hundred and fifty feet.

Lake Superior, the largest of those inland seas, communicates with the northern extremity of Lake Huron, by the river and rapids of St. Marys. The fall of these is not ascertained; but it is said that a small canal has been opened around the most difficult part by the Northwest Fur Company.

Five of the Atlantic rivers approach the waters of the St. Lawrence, viz: The Penobscot, Kennebeck, Connecticut, the North or Hudson River, and the Tioga branch of the Susquehannah. This last river will afford a useful communication with the rivers Seneca and Genesee, which empty into Lake Ontario. The length of the portage has not been precisely stated; and the general navigation of the Susquehannah has already been noticed. It may, however, be observed that it is the only Atlantic river whose sources approach both the western waters and those of the St. Lawrence.

The three eastern rivers afford convenient communications with the province of Lower Canada, but not with that extensive inland navigation which penetrates through the United States, within two hundred miles of the Mississippi. No statement has been received of any improvement having yet been made on the Penobscot or Kennebeck; and a very imperfect account has been obtained of some short canals opened around the several falls of the river Connecticut. One at Bellows Falls, in the State of Vermont, has been particularly mentioned, and is the highest improvement on the river.

What is called the North River is a narrow and long bay, which in its northwardly course from the harbor of New York breaks through or turns all the mountains, affording a tide navigation for vessels of eighty tons to Albany and Troy, one hundred and sixty miles above New York. This peculiarity distinguishes the North River from all the other bays and rivers of the United States. The tide in no other ascends higher than the granite ridge or comes within thirty miles of the Blue Ridge or eastern chain of mountains. In the North River it breaks through the Blue Ridge at West Point and ascends above the eastern termination of the Catskill or great western chain.

A few miles above Troy, and the head of the tide, the Hudson from the north and the Mohawk from the west unite their waters and form the North River. The Hudson in its course upwards approaches the waters of Lake Champlain, and the Mohawk those of Lake Ontario.

I. Hudson and Champlain, or Northern Navigation.

A company was incorporated several years ago by the State of New York for the purpose of opening this communication and a survey taken by Mr. Weston, a copy of which has not yet been obtained. From collateral information it appears that it was proposed to open a canal twelve miles long, with a lockage of one hundred and six feet, from Waterford, at the confluence of the Hudson and Mohawk, to the

upper end of the great falls of Stillwater. This was considered as the most difficult part of the whole route, and the expense estimated at $275,000. Another canal and lock would be necessary around the falls of Fort Miller; but the remainder of the navigation up the Hudson to Fort Edward does not require any material improvement.

At some distance above Fort Edward it was intended to connect, by a canal and locks, the Hudson with the North Wood Creek at Fort Ann. The navigation down the creek to Skeensborough is used, but requires to be improved. At this place, where falls render another canal necessary, North Wood Creek empties into the south bay of Lake Champlain, and thence is a natural sloop navigation through the whole extent of the lake. The expense of the works from Fort Edward to Skeensborough had been estimated at $200,000.

The funds of the company were insufficient and have, it is said, been expended without much permanent utility at Stillwater and Skeensborough.

The distance in a straight line from Waterford to Skeensborough is fifty miles; and the expense of opening a permanent boat navigation on a proper plan through the whole line is, from imperfect materials, estimated at about $800,000. This communication would divert to a port of the United States the trade of one-half of the State of Vermont and of a part of that of New York, which is now principally carried through the channel of the St. Lawrence and of the province of Canada.

II. Mohawk and Ontario, or Western Navigation.

A company incorporated by the State of New York for the improvement of this navigation has made considerable progress, and an accurate survey having been taken of the distances and levels of the greater part of the route, the result will, in the first place, be stated.

	Dist. Miles.	Fall. Feet.
From the tide water at Troy to Lansing Mills on the Mohawk is found the greatest impediment to the navigation of that river, consisting of the Cohoes Falls, which are seventy feet perpendicular, and of a succession of other falls, which continue to the North River	4⅔	140
From Lansing Mills up the Mohawk to Schenectady the height of the river, at the time when the survey was taken, prevented Mr. Weston from correctly ascertaining the levels. The fall for that distance is therefore estimated at	12⅓	28¼
From Schenectady to the Little Falls	57½	110½
The Little Falls, which before the improvements made by the company, interrupted altogether the navigation	¾	42
From the Little Falls to Fort Stanwix, now Rome	48	59½
This is the head of the navigation, and the summit level between it and West Wood Creek, a branch of Lake Ontario, is nine feet and three quarters above that part of the river Mohawk, where the navigation ceases	1¾	9¾
	125	390

The whole course of the Mohawk is therefore one hundred and twenty-five miles in length, and the fall through that distance from the summit level to tide water is three hundred and ninety feet.

	Dist. Miles.	Fall. Feet.
At the distance of one mile and three-quarters is Wood Creek, the bed of which is used to its entrance into Lake Oneida, the distance along its meanders being twenty-three miles, but in the line in which a canal might be cut, only fourteen miles, and the fall sixty feet	14	60
The Oneida forms a natural canal of twenty miles in length, and communicates by the Onondaga and Oswego rivers with Lake Ontario. The distance by water down those two rivers to Oswego, on Lake Ontario, is sixty-three miles. The upper part of the navigation is generally good, but the last twelve miles from the Oswego Falls, which are not passable, to Lake Ontario, are a continued rapid. The fall from Lake Oneida to Lake Ontario has not been ascertained by actual measurement, but is estimated at one hundred and thirty feet. From Rotterdam, on Lake Oneida, to the mouth of Salmon Creek on Lake Ontario, a few miles east of Oswego, the distance is twenty-two miles; and the ground being favorable, it is expected that the line of canal would not exceed twenty-six miles	20	
	26	130
	60	190

The elevation of the summit level between the Mohawk and the waters of Lake Ontario, being only three hundred and ninety feet above the tide water at Troy, and one hundred and ninety feet above Lake Ontario, a canal navigation is practicable the whole distance. Whether this should be attempted for a sloop or boat navigation must depend principally, if not altogether, on the supply of water. It is stated that the canal from the summit level to Troy must necessarily follow the valley of the Mohawk, and perhaps occasionally enter and cross the river. Calculated for a boat navigation the expense may be estimated as follows:

Mr. Weston estimated the expense of a canal, from Lansing Mills to tide water at Troy, around the Cohoes Falls, at	$250,000
The distance from the summit level to Lansing Mill is 120 miles, and to Lake Ontario, deducting the twenty miles occupied by Lake Oneida, forty miles, together one hundred and sixty miles of canal, the digging of which, at $8,000 a mile, is	1,280,000
The fall from the summit level to Lansing Mills is two hundred and fifty feet, and to Lake Ontario one hundred and ninety feet, together four hundred and forty feet lockage, which will require fifty-five locks of eight feet lift each. These at $7,500, the cost of the stone locks erected by the company at the Little Falls, will cost about	420,000
Feeders and aqueducts may be estimated at	250,000
Making altogether two millions two hundred thousand dollars	2,200,000

It is not believed that a sloop navigation, if practicable, could be effected for a less sum than five millions of dollars. The following works have already been completed by the company:

At the Little Falls a canal three-quarters of a mile in length has been opened, and a descent of 42 feet effected by six locks of solid masonry, each of which is 70 feet long and 12 feet wide. At the German flats, four miles above the Little Falls, another canal one mile in length, with two stone locks of the same materials and dimensions, effects a descent of ten feet.

On the summit level a canal one mile and three-quarters in length and supplied with water from the river Mohawk by a short feeder, unites that river and Wood Creek by means of two locks of the same

dimensions and materials, one at each extremity of the canal. All those canals are two feet and a half deep, twenty-four wide at bottom, and thirty-two at top, and admit boats of ten tons. It is proper to state that at first wooden locks had been erected at the Little Falls and brick locks on the summit canal. At both places they had become totally unfit for service at the end of seven years, and it was necessary to replace them by stone locks—a circumstance which increased considerably the expense of the undertaking.

Several minor improvements have been made on the Mohawk, and the navigation of Wood Creek, of which the principal defect is want of water, has been improved by raising dams and by the erection of four temporary wooden locks; but until a canal shall have been opened the whole distance from the summit level to Lake Oneida, the navigation will be imperfect and the profits inconsiderable.

The funds of the company do not enable them to undertake the necessary improvements at the two extremities of the line, a canal around the Cohoes Falls to tide water and another canal from Lake Oneida to Lake Ontario. The usual portage at the first place is from Schenectady to Albany, and a very good and expensive artificial road of sixteen miles, made by another company, unites the two towns. Another company has lately been incorporated for the purpose of making an artificial road at the other extremity of the line from Rotterdam, on Lake Oneida, to Salmon Creek, on Lake Ontario.

The capital of the company is two hundred and thirty-two thousand dollars, of which the State of New York owns ninety-two thousand. But, with the exception of one dividend of three per cent, all the tolls have been applied to the works; and, including these, and a debt of twenty thousand dollars due by the company, the whole expenditure amounts to three hundred and seventy thousand dollars. The annual tolls do not yet exceed thirteen thousand dollars.

III. Niagara.

The fall from Lake Erie to Lake Ontario has already been stated at four hundred and fifty feet. A company had also been incorporated by the State of New York for the purpose of opening a canal at this place; but it does not appear that anything ever was attempted after the survey had been made. The intention seems to have been to open a canal navigation for boats only from Fort Schlosser to Devil's Hole; the lake itself and Giles's Creek would have supplied the water, and the expense was estimated at four hundred and thirty-seven thousand dollars.

It is, however, evident that the canal, in order to be as eminently useful as the nature of the undertaking seems to require, should be on such scale as to admit vessels which can navigate both lakes. Considering the distance which in that case must be extended to about ten miles, and the lockage of four hundred and fifty feet, it is not believed that the expense can be estimated at less than one million of dollars.

The works necessary to effect water communications between the tide water of the North River, the St. Lawrence, and all the lakes, (Lake Superior only excepted,) are, therefore, estimated at four millions of dollars, viz:

Northern navigation to Lake Champlain	$800,000
Western navigation to Lake Ontario	2,200,000
Falls of Niagara for a sloop navigation	1,000,000
	4,000,000

The papers relative to these communications will be found under the letter B. But their utility will not be confined to the extensive navigation of the lakes themselves, for the mountains being completely turned when arrived into Lake Erie, the ridge which separates the waters emptying into that and into Lake Michigan from the northern branches of the Ohio and from the waters of the Mississippi is of a moderate elevation, and is gradually depressed in its course westwardly. There is no doubt of the practicability of opening canals at a future period between several of those waters, either by selecting proper levels or by means of short tunnels across favorable parts of the ridge. It will at present be sufficient to point out the principal communications now in use.

The distance from Lake Erie to Lake Chetoughe, an extensive and important and elevated reservoir which is the source of the Canowango, a branch of the Allegany, is seven miles by a continual ascent, the elevation of which is not ascertained.

From Presque Isle, on Lake Erie, to Le Bœuf, on French Creek, another branch of the Allegany, the distance is sixteen miles, and a company is incorporated by the State of Pennsylvania for making an artificial road across that portage.

The navigation from Lake Chetoughe and from Le Bœuf to Pittsburg offers no impediment whenever the waters are high; and the greater part of the salt now consumed in the northwest counties of Pennsylvania, as far as Pittsburg, and some distance down the Ohio, is brought from the salt springs of New York by Oswego, through Lake Ontario; thence across the portage of Niagara to Lake Erie; and thence, by either of the two last mentioned portages, to the waters of the river Allegany.

The distance from the place where the Cayuga, a river emptying into Lake Erie, ceases to be navigable to the navigable waters of the Muskingum, which empties into the Ohio one hundred and seventy miles below Pittsburg, is only six miles; and a company is said to be formed for the improvement of that communication.

Sandusky River and the Scioto take their sources in the same swamp. The navigation of the Miami of Lake Erie is interrupted by some falls; but its upper branches approach those of the Miami of the Ohio, and of the Wabash, and are stated as being nearly on the same level.

The Illinois River, which empties into the Mississippi above St. Louis, rises in a swamp, which, when the waters are high, affords a natural canoe navigation to the source of Chicago Creek, a short stream, which falls into Lake Michigan at its southern extremity.

Another communication generally used by the Indian traders is that from Green Bay, also in Lake Michigan, to the Mississippi by Fox River and the Wisconsin. Nor is there any doubt that, if the inland

navigation between the North River and the lakes was completely opened, the whole Indian trade either of the Mississippi by Lake Michigan, or of the northwest by Lake Superior, must necessarily centre in an Atlantic port of the United States—a consideration of minor importance as a commercial object, when compared with the other advantages of that great communication, but of great weight in its relation to the political intercourse of the United States with the Indians.

INTERIOR CANALS.

Under this denomination will be included all the canals of which any knowledge has been obtained, and which are not immediately on the rivers opening communications with the western waters or with those of the St. Lawrence, although some of them may be considered as extending those communications to more remote seaports. The documents from which the information is extracted will be found under the letters C c.

I. Merrimack.

The navigation of that river, which, rising in the State of New Hampshire, falls into the sea at Newburyport, after a course of one hundred and eighty miles, is interrupted by several falls. A canal, called Blodget's Canal, has been opened around Asmoskeag Falls; lower down, and about forty miles from the sea, the Essex Canal, four miles in length, and admitting boats drawing three feet and a half, will open a communication around the Patucket Falls, effecting, through three locks, a descent of thirty-four feet. From the lower extremity of the canal the river is navigable to the head of the tide at Haverhill, although the fall be forty-five feet within that distance. No particular account has been received of the capital expended, but it is believed that the work will be profitable to the undertakers.

The Middlesex Canal, uniting the waters of that river with the harbor of Boston, is, however, the greatest work of the kind which has been completed in the United States.

That canal, 12 feet wide and 3½ feet deep, draws its supply of water from Sudbury or Concord River, a branch of the Merrimack, and, from the summit ground, extends six miles, with a descent of 28 feet, to the Merrimack above the Patucket Falls, and 22 miles, with a descent of 107 feet, to the tide water of the harbor of Boston. The descent to the Merrimack is effected by three, and that to the tide water, by nineteen, locks. They are all 90 feet long, 12 feet wide, of solid masonry and excellent workmanship.

In order to open that canal, it was necessary to dig in some places at the depth of 20 feet, to cut through ledges of rocks, to fill some valleys and morasses, and to throw several aqueducts across the intervening rivers. One of these, across the river Shawshine, is 280 feet long, and 22 feet above the river. All those obstacles have been overcome, and boats of 24 tons, 75 feet long, and 11 feet wide, can navigate the canal. Those in most general use are of smaller dimensions, and are drawn by two horses at the rate of three miles an hour. A raft of one mile in length, and containing 800 tons of timber, has been drawn by two oxen, part of the way, at the rate of one mile an hour. Common boats pass from one end of the canal to the other in

twelve hours. The capital expended on the work is stated at $478,000; and the water-rights and necessary land cost a further sum of $58,000; the total expense has exceeded $550,000. The tolls have never yet exceeded $17,000 a year, but are increasing.

Several other canals have been contemplated in the State of Massachusetts, intended to unite the waters of Providence or Pawtucket River, with those of Charles River, which falls into the harbor of Boston, and of the river Connecticut. The grounds have been surveyed, but no particular description has been obtained, and the works have not yet been commenced.

II. Schuylkill and Delaware.

A company was incorporated several years ago, by the State of Pennsylvania, for opening a canal from Norristown, on the river Schuylkill, to the tide water of the Delaware at Philadelphia. The distance is 16 miles, the fall 53 feet, and the canal, deriving its water from the Schuylkill, would have been carried on a level to Philadelphia, and in its descent to the Delaware supplied the city with water and the shipping with docks. The expense had been estimated at $533,000; the work was commenced, one-third part of the digging effected, and a considerable sum expended; but, either from want of funds, or from an improper selection of the ground, or from other causes, not fully understood, the undertaking, if not altogether abandoned, has been suspended for several years.

This canal was intended as the first link of an extensive western communication. The Schuylkill from Norristown to Reading, 46 miles higher up the river, being navigable a great portion of the year, was considered as the next link.

III. Schuylkill and Susquehannah.

Another company was incorporated for the purpose of opening an inland navigation between Reading, on the Schuylkill, to Middletown, on the Susquehannah. Both towns are in the great limestone valley, beyond the Blue Ridge, and the distance is 70 miles. It had been at first supposed that it would be sufficient to cut a canal four miles in length, on the summit level, between the two rivers, and thereby to unite the Tulpehocken, which falls into the Schuylkill, with the Quitipahilla, a branch of the Swatara, which empties into the Susquehannah. But it was soon ascertained that the original plan of improving, by a succession of dams, the navigation of those small rivers was erroneous, and that it would be necessary to cut a canal the whole way.

The summit level is at an elevation of 310 feet above the Schuylkill, and of 308 feet above the Susquehannah. Adjacent springs are considered sufficient for the upper locks, and the creeks would, after a short descent, afford an abundant supply. The proposed dimensions of the canal were, a breadth of 20 feet at the bottom, and a depth of 3½ feet, and the expense was estimated at near $1,500,000.

The work was commenced; the canal has been cut the whole distance of four miles on the summit level; five locks, made of brick, have been constructed; land and water-rights have been purchased, and a considerable capital has been expended. But although the State of Pennsylvania has permitted the company to raise $266,600,

by lottery, and is bound to pay to them $300,000 whenever the work shall have been completed, it remains suspended for want of funds.

The great lockage necessary for this canal is the principal objection to that line of communication; and it has been suggested that a canal from Columbia, on the Susquehannah, to tide water, or to the great Delaware and Chesapeake Canal, would be much less expensive, and equally beneficial, both to the interior country and to Philadelphia. This question, as many others suggested in this report, can not be decided by any but practical and skilful engineers.

IV. Appomattox.

A company has been incorporated for opening a canal from the upper end of the falls of that river, which is the south branch of James River, to Petersburg, on the head of the tide. The distance is five miles, and the descent more than 30 feet, to a basin about 60 feet above the tide, in which the canal will terminate. The water is drawn from the river; and the canal, 16 feet wide, 3 feet deep, and admitting boats of 6 tons, is nearly completed. The capital already expended amounts to $60,000; but the company own thirty negroes, and suppose that their labor, and a further sum of $10,000, will be sufficient to build the locks, and to dig about half a mile, which remains to be cut in order to open the communication between the river and the basin. This work, which has been carried on with much zeal, and at a small expense, will open an important navigation of near 100 miles.

V. Neuse and Beaufort.

The harbor of Beaufort, in North Carolina, and which must not be confounded with that of the same name in South Carolina, admits vessels drawing 18 feet of water. Ocracoke Inlet, the only navigable entrance into the Pamlico and Albermarle sounds, that extensive estuary of the rivers Chowan, Roanoke, Tar, and Neuse, has less water, and is seventy miles from Newburn, on the last mentioned river. The distance between Newport or Beaufort river and the Neuse being only three miles, and the elevation of the highest intervening ground no more than seven feet above tide water, a canal, uniting the two rivers, was undertaken by a company incorporated for that purpose by the State of North Carolina. All the shares have, from particular circumstances, become the property of one individual; and the work which had been commenced some years ago, is now suspended.

VI. Cape Fear River.

A company, incorporated by the same State for improving the navigation of this river, after having exhausted a portion of their funds, which did not exceed $12,000, in fruitless attempts to improve the natural navigation of the river, have opened a canal with a lock, which opens a safe passage around the Buckhorn or Great Falls, seven miles below the junction of the Deep and Haw rivers. Another canal, six miles in length, with two locks, is necessary, around Smilie's Falls. Nearly half that distance has been completed; but the work is now suspended for want of funds. The legislature has lately authorized the company to increase their capital.

VII. New Orleans.

The canal Carondelet, which has already been mentioned, extends from Bayou St. John to the fortifications or ditch of the city, and thereby opens an inland communication with Lake Pontchartrain. A company is incorporated by the Territorial Legislature for the purpose of repairing and improving that work and of uniting the canal by locks with the Mississippi. Independent of other advantages, this undertaking would enable Government to transport with facility and use the same naval force for the defence of both the Mississippi and Lake Pontchartrain, the two great avenues by which New Orleans may be approached from the sea.

TURNPIKE OR ARTIFICIAL ROADS.

A great number of artificial roads have been completed in the Eastern and Middle States, at an expense varying from less than $1,000 to $14,000 a mile. The labor bestowed on the least expensive species consists in shortening the distance, diminishing the ascent of hills, removing rocks, levelling, raising, and giving a proper shape to the bed of the roads, draining them by ditches, and erecting bridges over the intervening streams. But the natural soil of the road is used, instead of covering it with a stratum of gravel or pounded stones.

It appears, by one of the papers marked D., under which letter will be found all the information which has been obtained respecting roads, that fifty turnpike companies have been incorporated since the year 1803 in the State of Connecticut alone, and that the roads undertaken by those companies are all of that description. Thirty-nine of those roads, extending together 770 miles, are completed. The most expensive is that from New Haven to Hartford, which has cost $79,261, or, the distance being 34¾ miles, at the rate of $2,280 a mile; but about $18,000 of the capital have been expended in the purchase of the land through which the road is carried. The nett income on this road, deducting the annual repairs and expenses from the annual tolls, does not exceed $3,000. Of six of the roads, which, together, extend 120 miles, no account has been received. The other thirty-two extend, together, 615 miles, and have cost only $340,000, or, on an average, at the rate of $550 a mile, and it seems that the aggregate of annual tolls on the whole is $86,000, from which, deducting the annual repairs and expenses, amounting to $48,000, leaves a nett income of $38,000, or of about 11 per cent on the capital expended.

No particular account has been received of the roads in the other Eastern States, but it is known that besides some of a similar description with those of the State of Connecticut several of a more expensive kind have been completed, particularly in Massachusetts. The cost has varied from $3,000 to $14,000 a mile, and amongst artificial roads of the first grade may be mentioned those from Boston to Providence, to Salem, and to Newburyport. These are all covered with an artificial stratum of gravel or pounded stones and finished in the most substantial manner. Great expense has also been incurred in order to shorten the distance without exceeding the angle of ascent, which is fixed at five degrees, and it is stated that the road to Newburyport, thirty-two miles in length, and in which marshes and rocks presented considerable obstacles, has cost $400,000, or at the rate of $12,500 a

mile. Those expensive roads, however useful and permanent, appear to be much less profitable than those of Connecticut. The Salem road is said to yield six per cent. Another road has been stated as yielding eight per cent. The income of all the others in the State of Massachusetts is said not to exceed on an average three per cent, and that of the road from Boston to Newburyport amounts to no more than two per cent.

A greater capital has been vested in turnpike roads in the State of New York than in any other. In less than seven years sixty-seven companies have been incorporated, with a nominal capital of near $5,000,000, for the purpose of making more than three thousand miles of artificial roads, and twenty-one other companies have also been incorporated, with a capital of $400,000, for the purpose of erecting twenty-one toll-bridges. Although no particular account has been received either of the capital actually expended, of the annual amount of tolls, or of the materials of the roads, it is known that great progress has been made, and it has been stated that nine hundred miles of road were already completed by twenty-eight companies, whose capital amounted to $1,800,000, and who had two hundred miles more of road to finish.

Those roads extend in every direction, but particularly from every town or village on the North River, westwardly and northwestwardly towards the waters of the Susquehannah and those of the Great Lakes. The most expensive is that from Albany to Schenectady, fourteen miles long, and which has cost at the rate of $10,000 a mile. Near one hundred and forty miles of roads extending westwardly from Albany and Schenectady appear to have cost at the rate of $2,500 or $3,000 a mile. The expense of all the others does not seem, on an average, to exceed $1,250 a mile.

More detailed information has been obtained respecting the roads in New Jersey, Pennsylvania, and Maryland.

In New Jersey a turnpike road has lately been completed from Trenton to Brunswick. The distance is twenty-five miles, the greatest angle of ascent, three degrees; and the road is nearly in a straight line, the only considerable obstruction being the "sand hills," through which it was necessary to dig at the depth of thirty feet in order not to exceed the angle of ascent. The road is thirty-six feet wide, fifteen feet of which are covered with about six inches of gravel. A few wooden bridges with stone abutments and piers have been erected across the intervening streams. The whole expense is stated at $2,500 a mile. From Brunswick the road will be extended to Elizabethtown, and the work is now progressing. Another road has been undertaken in the same State from Brunswick to Easton on the river Delaware. The distance is forty-three miles, of which eleven have been completed at an expense of $40,000. This road will be more expensive than the preceding, both on account of the ground, the bridges being more numerous, and the Blue Ridge (Musconekong Mountain) intervening, and because a more substantial facing or greater thickness of gravel is requisite. The funds of the company are exhausted.

In Pennsylvania artificial roads of the most substantial kind have been completed or are progressing from Philadelphia in sundry directions.

The principal are to Bristol and Trenton, twelve miles of which are completed; to Germantown and Perkioman, with two branches to Willow Grove and to Chestnut Hill; and to Lancaster and Columbia, with a branch to Harrisburg.

The distance from Philadelphia to Perkioman is twenty-five miles and a quarter; the two branches extend one ten miles and the other seven miles and a half, making together near forty-three miles. The angle of ascent is four degrees; the breadth of the road fifty feet, of which twenty-eight feet, having a convexity of fifteen inches, are covered with a stratum either of gravel eighteen inches thick or of pounded stones twelve inches thick. One-half of the stones, forming the lower part of the stratum, are broken into pieces not more than five inches in diameter; the other half, or upper part of the stratum, consists of stones broken into pieces not more than two inches and a half in diameter, and this difference in the size of the stones is represented as a considerable defect. Side or summer roads extend on each side of the gravel or stone road. The five miles next to Philadelphia have cost at the rate of $14,517 a mile; the other twenty miles and a half at the rate of $10,490 a mile. Yet there were no natural impediments, and only small bridges or culverts were necessary. The capital expended on these twenty-five miles and a half is $285,000; the tolls amount to $19,000; the annual repairs and expenses to $10,000; the nett income to about $9,000, or little more than 3 per cent on the capital expended.

The distance from the Schuylkill at Philadelphia to Lancaster is sixty-two miles and a quarter. Exclusively of the side or summer roads twenty-four feet of the bed of the road are covered with a stratum of pounded stones, eighteen inches thick in the middle of the road and decreasing each way to twelve inches. The valley hills are the most elevated and steep on the road; but the angle of ascent nowhere exceeds four degrees. Stone bridges have been erected across all the intervening streams. That across the river Conestogo, consisting of nine arches, is private property, and the most expensive built by the company is that across the Brandywine, consisting of three arches of solid masonry, and which cost $12,000. The capital of the company amounted to $360,000; but this being insufficient, it became necessary to apply a considerable portion of the tolls to the completion of the work. The whole expense amounts to $465,000, or at the rate of about $7,500 a mile. The annual tolls have not yet exceeded $25,000, and the annual repairs and expenses are estimated at $13,000, leaving a nett income of about $12,000. The prospect of an increased profit, derived from the proposed extension of the road, has, however, raised the price of that stock nearly to par.

The Lancaster road, the first extensive turnpike that was completed in the United States, is the first link of the great western communication from Philadelphia. It has been extended ten miles westwardly to Columbia on the Susquehannah, and another branch is now progressing northwestwardly to Harrisburg, also on the Susquehannah and thirty-six miles from Lancaster. The State of Pennsylvania has also incorporated two companies in order to extend the road by two different routes as far as Pittsburg on the Ohio, and near three hundred miles from Philadelphia. The southern route following the main post road passes by Bedford and Somerset. The northern route passes by Huntingdon and Frankstown, the highest point to

which the Juniata branch of the Susquehannah is navigable. To this route the State has authorized a subscription of $100,000.

Other roads in a northwest direction from Philadelphia towards the Genesee, and Presque Isle on Lake Erie, are also progressing and have been encouraged by the subscriptions or donations of the legislature. They are generally on a much less expensive plan than those in the direction of Pittsburg. A section of thirty miles from Lausanne, on the Lehigh, to Nescopeck, on the Susquehannah, has been completed at the expense of $36,000 by a company, and it is intended to extend it seventy miles further to Newton on the Tioga branch of the Susquehannah.

In Maryland, roads extending from Baltimore in various directions have lately been undertaken by several companies and are rapidly progressing. On the falls turnpike, which extends in a northerly direction, about four miles of a road twenty-two feet wide, covered with a stratum of pounded stones ten inches thick, and having an ascent not exceeding four degrees, have been completed at the rate of $7,500 a mile.

The "Reistertown" turnpike, in a northwestwardly direction, extends sixteen miles to that village, whence two branches, extending one nineteen and the other twenty-nine miles further, will enter Pennsylvania at two different places. The road, twenty-four feet wide, is covered with a stratum twelve inches thick of pounded stones not more than three inches in diameter. The angle of ascent does not exceed three degrees and a half. Ten miles have been completed at the expense of $10,000 a mile, and the work is progressing. The capital of the company amounts to $420,000.

The capital of the "Fredericktown" turnpike company amounts to $500,000, and the company is authorized to open the great western road as far as Boonsborough, beyond the Blue Ridge, and sixty-two miles from Baltimore. The angle of ascent will not exceed four degrees, the road has a convexity of nine inches, and on a breadth of twenty-two feet is covered with a stratum ten inches thick of pounded stones not exceeding three inches in diameter, over which are spread two inches of gravel or coarse sand. The first twenty miles next to Baltimore have cost at the rate of $9,000, and the next seventeen miles are contracted for at the rate of $7,000 a mile.

The distance from Boonsborough to Cumberland, at the foot of the Allegany mountains, following the present road, is seventy-three miles, and although the company is not yet authorized to extend the turnpike to that place the ground has been surveyed, and it is ascertained that the road may be continued with an angle of ascent not exceeding four degrees. The ascent of the road laid out by the United States from Cumberland to Brownsville, on the Monongahela, does not exceed five degrees, and the distance is seventy-two miles, making the whole distance of a turnpike road from Baltimore to the navigable waters of the Ohio two hundred and seven miles.

The distance from the city of Washington to the same spot on the Monongahela is some miles shorter, being, as has already been stated, the shortest communication between tide water and the navigable western waters.

South of the Potomac few artificial roads have been undertaken. From Alexandria one is now progressing, in a northwestwardly direction, towards Middleburg. Another has lately been commenced from

Richmond to Ross's coal mine; but the only one which, so far as any accounts have been received, is completed extends twelve miles from Manchester, opposite to Richmond, in a westwardly direction, to the coal mines of Falling Creek. This road, thirty-six feet wide, is gravelled and has cost $50,000; but the last four miles did not cost more than at the rate of $3,000 a mile. Yet it is sufficiently substantial, the route being very level, to admit wagons carrying four tons.

The greater progress made in the improvement of roads in the northern parts of the Union must be principally ascribed to a more compact population, which renders those improvements more necessary, and at the same time supplies with greater facility the means of effecting them. The same difference is perceptible in the number of bridges erected in the several States.

In the Eastern States, and particularly Massachusetts, wooden bridges, uniting boldness to elegance, and having no defect but want of durability, have been erected over the broadest and deepest rivers. In the lower counties of Pennsylvania stone bridges are generally found across all the small streams. Both in that State and at some distance eastwardly bridges with stone piers and abutments and a wooden superstructure are common over wide rivers. Of these the most expensive, and which may be considered as the first in the United States, is the permanent Schuylkill bridge near Philadelphia, erected by a company at an expense of $300,000. Its length, including the abutments, does not exceed 750 feet, and it is supported only by two piers and the abutments; but those piers, 195 feet apart, are of the most solid workmanship, and one of them was sunk at a depth of more than 24 feet below low water. The bridge is 42 feet wide, and the wooden superstructure is enclosed and covered with a shingle roof.

The want of bridges south of Pennsylvania, even on the main post road, is sensibly felt. One lately thrown across the Potomac three miles above the city of Washington, and which without any intervening piers is wholly suspended to iron chains extending from bank to bank, deserves notice on account of the boldness of its construction and of its comparative cheapness. The principle of this new plan, derived from the tenacity of iron, seems applicable to all rapid streams of a moderate breadth.

The general principles of improved roads seem to be, 1st, the reduction of hills by diminishing the angle of ascent, which ought not to exceed, whenever practicable, three and a half degrees, and, under no circumstances, five degrees; 2dly, a sufficient convexity in the bed of the road, together with ditches and drains, all which are intended to prevent the injury caused by standing water or freshets; 3dly, an artificial bed of pounded stones or gravel, sufficiently substantial to support the weight of the carriages in general use on the road, either for the conveyance of persons or for the transportation of merchandise.

On the last point, it appears, from the facts already stated or scattered in the communications received on that subject, 1st, that the stones ought to be similar in quality and reduced to the same size, should not exceed three inches in diameter; 2d, that the preferable qualities of stone rank in the following order: Hard black stone, granite, flint or quartz, blue limestone, white limestone; 3d, that the stratum may be either of pounded stones, 12 inches thick, or of pounded stones, 10 inches thick, with 2 inches of gravel spread over the stones, or entirely of gravel, 18 inches thick; 4th, that, when the materials are equally convenient, the expense of those three modes

[illegible]

[illegible]

[illegible]

Those which appear most necessary for the communications between the Atlantic and western rivers have already been mentioned under that head; and the improvement of the water communication between the North River and the Great Lakes ought to take the precedence of any other in that direction.

That road which, therefore, seems exclusively to claim public attention, is a great turnpike extending from Maine to Georgia in the general direction of the seacoast and main post road, passing through all the principal seaports. The general convenience and importance of such a work are too obvious to require any comments; and the expense seems to be the primary object of consideration.

The distance will be roughly estimated at one thousand six hundred miles; and from what has been stated on the subject of roads generally it may be inferred that the greater part of the road being intended almost exclusively for travelling, and not for transportation of heavy articles, the expense cannot exceed the rate of three thousand dollars a mile. For although some detached portions of the route, being commercial roads, must be improved as such, and at a greater expense, an equivalent reduction in other parts will result from those portions which are already improved by private companies, and from the impossibility, for want of materials for an artificial stratum, of going in some places beyond what has been described as the first or cheapest species of turnpike. The whole expense may, therefore, be estimated at $4,800,000. A secondary object, but of more importance to Government than to individuals, would be the improvement, on a much less expensive scale, of certain portions of roads leading to some points on the extremes of the Union, intended principally for the purpose of accelerating the progress of the mail and the prompt transmission of information of a public nature. The points contemplated are Detroit, St. Louis in Upper Louisiana, and New Orleans. The portions of road which, traversing a wilderness, cannot be improved without the aid of the United States are from the Tuscarora branch of the Muskingum to Detroit; from Cincinnati, by Vincennes, to St. Louis; and from Nashville in Tennessee or Athens in Georgia to Natchez. The expense necessary to enable the mail and even stages to proceed at the rate of eighty miles a day may, at the rate of about two hundred dollars a mile, including bridges over all the small streams, be estimated, for those three roads, at two hundred thousand dollars.

RECAPITULATION AND RESOURCES.

The improvements which have been respectfully suggested as most important in order to facilitate the communication between the great geographical divisions of the United States will now be recapitulated and their expense compared with the resources applicable to that object.

I. From north to south, in a direction parallel to the seacoast.		
1. Canals opening an inland navigation for sea vessels from Massachusetts to North Carolina, being more than two-thirds of the Atlantic seacoast of the United States, and across all the principal capes, Cape Fear excepted.....	$3,000,000	
2. A great turnpike road from Maine to Georgia along the whole extent of the Atlantic seacoast.....	4,800,000	
		$7,800,000

II. From east to west, forming communications across the mountains between the Atlantic and western rivers		
1. Improvement of the navigation of four great Atlantic rivers, including canals parallel to them	$1,500,000	
2. Four turnpike roads from those rivers across the mountains, to the four corresponding western rivers	1,000,000	
3. Canal around the falls of the Ohio	300,000	
4. Improvement of roads to Detroit, St. Louis and New Orleans	200,000	
		$4,000,000
III. In a northern and northwestern direction, forming inland navigations between the Atlantic seaboard and the great lakes and the St. Lawrence		
1. Inland navigation between the Neuse River and Lake Champlain	600,000	
2. Great inland navigation opening the whole way by canals from the Neuse River to Lake Ontario	1,200,000	
3. Canal around the falls and rapids of Niagara, opening a short navigation from Lake Ontario to the upper lakes as far as the extremities of Lake Michigan	1,000,000	
		4,000,000
Making together		12,000,000

IV. The great geographical features of the country have been such as to direct its principal lines of communications and those appear to embrace all the great interests of the Union and to be calculated to diffuse and increase the national wealth in a very general way by opening an intercourse between the remotest extremities of the United States. Yet it must necessarily result from an adherence to that principle that those parts of the Atlantic States through which the great western and northwest communications will be carried must, in addition to the general advantages in which they will participate, receive from those communications greater local and immediate benefits than the Eastern and perhaps Southern States. As the expense must be defrayed from the general funds of the Union, justice and, perhaps, policy not less than justice, seems to require that a number of local improvements, sufficient to equalize the advantages, should also be undertaken in those States, parts of States, or districts which are less immediately interested in those inland communications. Arithmetical precision cannot indeed be attained in objects of that kind; nor would an appropriation of the moneys expended according to the population of each State be either just or practicable. Since roads, and particularly canals, are often of greater utility to the States which they unite than to those through which they pass. But a sufficient number of local improvements, consisting either of roads or canals, may, without any material difficulty, be selected so as to do substantial justice and give general satisfaction. Without pretending to suggest what would be the additional sum necessary for that object, it will, for the sake of round numbers, be estimated at $3,400,000

Which added to the sum estimated for general improvements 16,600,000

Would make an aggregate of 30,000,000

An annual appropriation of two millions of dollars would accomplish all those great objects in ten years, and may without inconvenience be supplied in time of peace by the existing revenues and

resources of the United States. This may be exemplified in several ways.

The annual appropriation, on account of the principal and interest of the public debt, has, during the last six years, amounted to eight millions of dollars. After the present year, or, at furthest, after the ensuing year, the sum which, on account of the irredeemable nature of the remaining debt, may be applied to that object cannot in any one year exceed four million six hundred thousand dollars, leaving, therefore, from that source alone, an annual surplus of three million four hundred thousand dollars applicable to any other object.

From the 1st January, 1801, to the 1st January, 1809, a period of eight years, the United States shall have discharged about thirty-four millions of the principal of the old debt, or, deducting the Louisiana debt incurred during the same period and not yet discharged, about twenty-three millions of dollars. They may, with equal facility, apply, in a period of ten years, a sum of twenty millions of dollars to internal improvements.

The annual permanent revenue of the United States, calculated on a state of general peace, and on the most moderate estimate, was, in a report made to Congress on the 6th day of December, 1806, computed for the years 1809, 1815, at fourteen millions of dollars. The annual expenses on the peace establishment, and including the four million six hundred thousand dollars on account of the debt and four hundred thousand dollars for contingencies, do not exceed eight millions and a half, leaving an annual surplus of five millions and a half of dollars. To provide for the protection and defence of the country is undoubtedly the object to which the resources of the United States must, in the first instance, be applied, and to the exclusion of all others, if the times shall require it. But it is believed that, in times of peace, and to such period only are these remarks applicable, the surplus will be amply sufficient to defray the expenses of all the preparatory measures of a permanent nature which prudence may suggest and to pay the sum destined for internal improvements. Three millions annually applied during the same period of ten years would arm every man in the United States, fill the public arsenals and magazines, erect every battery and fortification which could be manned, and even, if thought eligible, build a navy. That the whole surplus would be inadequate to the support of any considerable increase of the land or naval force kept in actual service in time of peace will be readily admitted. But such a system is not contemplated; if ever adopted, the objects of this report must probably be abandoned, for it has not heretofore been found an easy task for any government to indulge in that species of expense, which, leaving no trace behind it, adds nothing to the real strength of the country, and, at the same time, to provide for either its permanent defence or improvement.

It must not be omitted that the facility of communications constitutes, particularly in the United States, an important branch of national defence. Their extensive territory opposes a powerful obstacle to the progress of an enemy; but, on the other hand, the number of regular forces which may be raised, necessarily limited by the population, will, for many years, be inconsiderable when compared with that extent of territory. That defect cannot otherwise be supplied than by those great national improvements, which will

millions of dollars, applied with more or less rapidity, according to the circumstances of the United States, would be amply sufficient.

The manner in which the public moneys may be applied to such objects remains to be considered.

It is evident that the United States can not, under the Constitution, open any road or canal without the consent of the State through which such road or canal must pass. In order, therefore, to remove every impediment to a national plan of internal improvements, an amendment to the Constitution was suggested by the Executive when the subject was recommended to the consideration of Congress. Until this be obtained, the assent of the States being necessary for each improvement, the modifications under which that assent may be given will necessarily control the manner of applying the money. It may be, however, observed that in relation to the specific improvements which have been suggested there is hardly any which is not either already authorized by the States respectively, or so immediately beneficial to them, as to render it highly probable that no material difficulty will be experienced in that respect.

The moneys may be applied in two different manners. The United States may, with the assent of the States, undertake some of the works at their sole expense, or they may subscribe a certain number of shares of the stock of companies incorporated for the purpose. Loans might also, in some instances, be made to such companies. The first mode would, perhaps, by effectually controlling local interests, give the most proper general direction to the work. Its details would probably be executed on a more economical plan by private companies. Both modes may, perhaps, be blended together, so as to obtain the advantages pertaining to each. But the modifications of which the plan is susceptible must vary according to the nature of the work and of the charters and seem to belong to that class of details which are not the immediate subject of consideration.

At present the only work undertaken by the United States at their sole expense, and to which the assent of the States has been obtained, is the road from Cumberland to Brownsville; an appropriation may, for that purpose, be made at any time. In relation to all other works, the United States have nothing at this time in their power but to assist those already authorized, either by loans or by becoming stockholders; and the last mode appears the most eligible. The only companies incorporated for effecting some of the improvements considered in this report as of national and first-rate importance, which have applied for such assistance, are the Chesapeake and Delaware Canal, the Susquehannah Canal, and the Dismal Swamp companies; and authority might be given to subscribe a certain number of shares to each on condition that the plan of the work to be executed should be approved by the General Government. A subscription to the Ohio Canal, to the Pittsburg Road, and perhaps to some other objects not fully ascertained is also practicable at this time. As an important basis of the general system, an immediate authority might also be given to take the surveys and levels of the routes of the most important roads and canals which are contemplated; a work always useful, and by which the practicability and expense of the undertakings would be ascertained with much more correctness than in this report. A moderate appropriation would be sufficient for those several objects.

In the selection of the objects submitted in obedience to the order of the Senate, as claiming, in the first instance, the aid of the General Government, general principles have been adhered to as best calculated to suppress every bias of partiality to particular objects. Yet some such bias, of which no individual is perfectly free, may, without being felt, have operated on this report. The National Legislature alone, embracing every local interest and superior to every local consideration, is competent to the selection of such national objects. The materials contained in the papers herewith transmitted, and the information to be derived from surveys taken under the authority of the General Government, will furnish the facts necessary for a correct decision. Two communications, by Mr. B. H. Latrobe and by Mr. Robert Fulton, (marked E and F,) are, in the meanwhile, respectfully referred to as containing much interesting practical information connected with observations of a general nature on the subject.

All which is most respectfully submitted.

ALBERT GALLATIN,
Secretary of the Treasury.

TREASURY DEPARTMENT, *April 4, 1808.*

* * * * * * *

[FULTON'S REPLY]

F.—No. 3.

WASHINGTON, *December 8, 1807.*

SIR: By your letter of the 29th of July, I am happy to find that the attention of Congress is directing itself towards the opening of communications through the United States by means of roads and canals; and it would give me particular pleasure to aid you with useful information on such works, as I have long been contemplating their importance in many points of view.

But a year has not yet elapsed since I returned to America, and my private concerns have occupied so much of my time, that, as yet, I have acquired but very little local information on the several canals which have been commenced.

Such information, however, is, perhaps, at present, not the most important branch of the subject, particularly as it can be obtained in a few months at a small expense, whenever the public mind shall be impressed with a sense of the vast advantages of a general system of cheap conveyance. I hope, indeed, that every intelligent American will, in a few years, be fully convinced of the necessity of such works to promote the national wealth, and his individual interest. Such conviction must arise from that habit of reflection which accompanies the republican principle, and points out their true interest on subjects of political economy. From such reflections arises their love of agriculture, and the useful arts, knowing them to augment the riches and happiness of the nation; hence also their dislike to standing armies and military navies, as being the means of increasing the proportion of non-productive individuals whose labor is not only lost, but who must be supported out of the produce of the industrious inhabitants, and diminish their enjoyments.

Such right thinking does great honor to our nation, and leads forward to the highest possible state of civilization, by directing the powers of man from useless and destructive occupations to pursuits which multiply the productions of useful labor, and create abundance.

Though such principles actuate our citizens, they are not yet, in every instance, aware of their best interests; nor can it be expected that they should perceive, at once, the advantages of those plans of improvement which are still new in this country. Hence the most useful works have sometimes been opposed, and we are not without examples of men being elected into the State Legislatures for the express purpose of preventing roads, canals, and bridges being constructed. But in such errors of judgment our countrymen have not been singular. When a bill was brought into the British Parliament, fifty years ago, to establish turnpike roads throughout the kingdom, the inhabitants, for forty miles round London, petitioned against such roads; their arguments were, that good roads would enable the farmers of the interior country to bring their produce to the London market cheaper than they who lived nearer the city, and paid higher rents; that the market would be overstocked, the prices diminished, and they unable to pay their rents or obtain a living. The good

sense of Parliament, however, prevailed, the roads were made, the population and commerce of London increased, the demand for produce increased, and he who lived nearest to London still had a superior advantage in the market.

In like manner I hope the good sense of our Legislature will prevail over the ignorance and prejudice which may still exist against canals. And here an important question occurs, which it may be proper to examine with some attention in this early stage of our public improvements, whether, as a system, we should prefer canals to turnpike roads. Our habits are in favor of roads; and few of us have conceived any better method of opening communications to the various parts of the States. But in China and Holland canals are more numerous than roads; in those countries the inhabitants are accustomed to see all their productions carried either on natural or artificial canals; and they would be as much at a loss to know how we, as a civilized people, could do without such means of conveyance as we are surprised at their perseverance and ingenuity in making them.* England, France, and the principal States of Europe, commenced their improvements with roads; but as the science of the engineer improved, and civilization advanced, canals were introduced, and England and France are now making every exertion to get the whole of their heavy productions water-borne; for they have become sensible of the vast superiority of canals over roads.

Our system, perhaps, ought to embrace them both; canals for the long carriage of the whole materials of agriculture and manufactures, and roads for travelling, and the more numerous communications of the country. With these two modes in contemplation, when public money is to be expended with a view to the greatest good, we should now consider which object is entitled to our first attention. Shall we begin with canals, which will carry the farmer's produce cheap to market, and return him merchandise at reduced prices? Or shall we first make roads to accommodate travellers, and let the produce of our mines and forests labor under such heavy expenses that they cannot come to market?

To throw some light on this interesting question, I will base my calculations on the Lancaster turnpike road. There the fair experiment has been made to penetrate from Philadelphia to the interior country; and the mode of calculation here given will serve for drawing comparisons on the utility of roads and canals for all the great leading communications of America.

From Philadelphia to the Susquehannah, at Columbia, is 74 miles; that road, if I am rightly informed, cost, on an average, 6,000 dollars a mile, or 444,000 for the whole. On it, from Columbia to Philadelphia, a barrel of flour, say 200 weight, pays one dollar carriage. A broad wheel wagon carries 30 barrels, or three tons, and pays for turnpike three dollars; thus for, each ton carried, the turnpike company receives only one dollar.

I will now suppose a canal to have been cut from Philadelphia to Columbia, and, with its windings, to make 100 miles, at $15,000† a mile; or, for the whole, $1,500,000. On such canal, *one man*, *one boy*, and *horse* would convey 25 tons 20 miles a day,‡ on which the following would be the expenses:

One man	$1.00
One horse	1.00
One boy	.50
Tolls for repairing the canal	1.00
Tolls for passing locks, inclined planes, tunnels, and aqueducts	1.00
Interest on the wear of the boat	.50
Total	$5.00

This is equal to 20 cents a ton for 20 miles, and no more than one dollar a ton for 100 miles, instead of ten dollars paid by the road. Consequently, for each ton carried from Columbia to Philadelphia on the canal, the company might take a toll of six dollars instead of one which is now got by the road; and then the flour would arrive at Philadelphia for seven dollars a ton instead of ten, which it now pays. The merchandise would also arrive at Columbia, from Philadelphia, for three dollars a ton

* The royal canal from Canton to Pekin is 825 miles long; its breadth, 50 feet; its depth, 9 feet.

† On averaging the canals of America, 15,000 dollars a mile will be abundantly sufficient to construct them in the best manner, particularly if made on the inclined plane principle with small boats, each carrying six tons.

‡ One horse will draw on a canal from 25 to 50 tons, 20 miles in one day. I have stated the least they ever do, and the highest rate of charges, that no deception may enter into their calculations.

[illegible]

[illegible]

[illegible]

that $3,500,000 were annually appropriated to canals; such a sum would pay for three hundred miles of canals each year; and in twenty years we should have six thousand miles circulating through, and penetrating into the interior of the different States. Such sums, though seemingly large, and such works, though apparently stupendous, are not more than sufficient to keep pace with the rapid increase of our population, to open a market, and carry to every district such foreign articles as we near the coast enjoy. With this view of the subject arises a political question of the utmost magnitude to these States, which is, that, as our national debt diminishes, and the treasury increases in surplus revenue, will it not be the best interests of the people to continue the present duties on imports, and expend the products in national improvements?

To illustrate this question, I will state some examples of the rate of duties, and the expense of carriage, to prove that, by keeping on the duties, and making canals with the revenue, goods, in a great number of instances, will be cheaper to the consumer than by taking off the duties, and leaving the transport to roads.

First example.

Brown sugar pays in duty two and a half cents per pound, or for one hundred pounds	$2.50
It pays for wagoning three hundred miles	5.00
Total	7.50

By the canal, it would cost, in boating, 15 cents for three hundred miles; consequently, the boating and duty would amount to $2.65; therefore, by keeping on the duty, and making the canal, sugar would arrive at the interior, three hundred miles, $2.35 the hundred weight cheaper than if the duties were taken off, and the transport left to roads.

Second example.

One bushel of salt, weighing fifty-six pounds, paid in duty	$0.20
To carry it three hundred miles by roads, the expense is	2.50
Total	2.70

By the canal, it would cost, for boating three hundred miles, 7½ cents. By keeping on the duties, and making the canals, it would arrive to the interior consumer 6½ cents the bushel cheaper than were the duties taken off, and the transport left to roads.

Third example.

Molasses pays 5 cents a gallon duty; this is, for one hundred pounds	$0.75
It pays for wagoning three hundred miles	5.00
Total	5.75

By the canal, the carriage would cost 15 cents, and it would arrive at the interior at $4.10 the hundred weight, or 27 cents a gallon cheaper than were the duties taken off, and the transport left to roads.

Numerous other articles might be stated to show that the real mode of rendering them cheap to the interior consumer is to keep on the duties, and facilitate the carriage with the funds so raised.

These, however, may be considered as partial benefits, and not sufficiently general to warrant keeping on the duties: but there is a point of view in which I hope it will appear that the advantages are general, and will be felt throughout every part of the States. It is by reducing the expense of all kinds of carriage, and thus economise to each individual more than he now pays in duty on the foreign articles he consumes; for example, wood for fuel is an article of the first necessity; it cannot bear the expense of transport twenty miles on roads; at that distance it is shut out from the market, and the price of fuel is consequently raised to the amount of carriage; were a cord of wood carried twenty miles on roads, it would pay for wagoning at least $3; on a canal it would pay 20 cents; thus, on only one cord of wood, there is an economy of $2.80.

Which economy would pay the duty on fourteen pounds of tea, at 20 cents the pound duty; or one hundred and forty pounds of sugar, at 2 cents the pound duty; or fifty-six pounds of coffee, at 5 cents the pound duty; or fourteen bushels of salt, at 20 cents the bushel duty; or fifty-six gallons of molasses, at 5 cents the gallon duty.

I will now suppose a city of fifty thousand inhabitants who, for their household and other uses, will consume fifty thousand cords a year, on which there would be an

18. REPORT OF WINDOM SELECT COMMITTEE

[*Note.*—This was the report of a Select Committee on Transportation Routes to the Seaboard authorized by resolution of the United States Senate, adopted December 16, 1872.[a]

As originally provided for, this Committee was composed of seven members of the Senate, as follows: William Windom, of Minnesota, chairman; John Sherman, of Ohio; Roscoe Conkling, of New York; Adelbert Ames, of Mississippi; John F. Lewis, of Virginia; Eugene Casserly, of California; and Thomas M. Norwood, of Georgia.[b]

At the special session of the Senate held after March 4, 1873, on March 26, 1873, a resolution was adopted providing for two additional members of the Committee, and the president pro tempore appointed John H. Mitchell, of Oregon, and Henry G. Davis, of West Virginia.[c]

After this enlargement the personnel of the Committee underwent further changes, and on February 24, 1874, was composed of the following members: William Windom, of Minnesota; John Sherman, of Ohio; Roscoe Conkling, of New York; J. Rodman West, of Louisiana; Simon B. Conover, of Florida; John H. Mitchell, of Oregon; Thomas M. Norwood, of Georgia; Henry G. Davis, of West Virginia; John W. Johnston, of Virginia.[d]

On March 26, 1873, the Senate adopted a resolution authorizing this Committee to sit at such places as they might designate during the recess and to investigate and report upon the subject of transportation between the interior and the seaboard; at the same time it authorized the Committee to employ a clerk and stenographer and to send for persons and papers. The resolution further provided that the actual and necessary expenses attending such investigation should be paid out of the contingent fund of the Senate upon vouchers approved by the chairman of the Committee.

The Committee visited various portions of the country and collected a mass of useful information relating to rail and water transportation in the United States.

The report of the Select Committee on Transportation Routes to the Seaboard was submitted to the Senate April 24, 1874, and was on the same day ordered to be printed.[e] The results of its investigations are published in two volumes containing more than 1,400 pages, including an appendix of 232 pages, in which appears a report by Henry G. Davis, as a committee of one, in regard to the James River and Kanawha Canal. Minority reports were made by Roscoe

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[a] Report of Select Committee on Transportation Routes to the Seaboard, Senate Reports, 1st sess., 43d Cong., Vols. I and II, 1873-74, 254 pp. and Appendix, 990 pp.

[b] Congressional Directory, 42d Cong., 3d sess., 1875, p. 60.

[c] Congressional Record, Vol. I, spec. sess., 43d Cong., 1873, p. 205.

[d] Congressional Directory, 43d Cong., 1st sess., p. 74.

[e] Congressional Record, 43d Cong., 1st sess., April 24, 1874, pp. 3334 et seq.

MAP SHOWING

INTERNAL IMPROVEMENTS

RECOMMENDED BY

COMMITTEE ON TRANSPORTATION

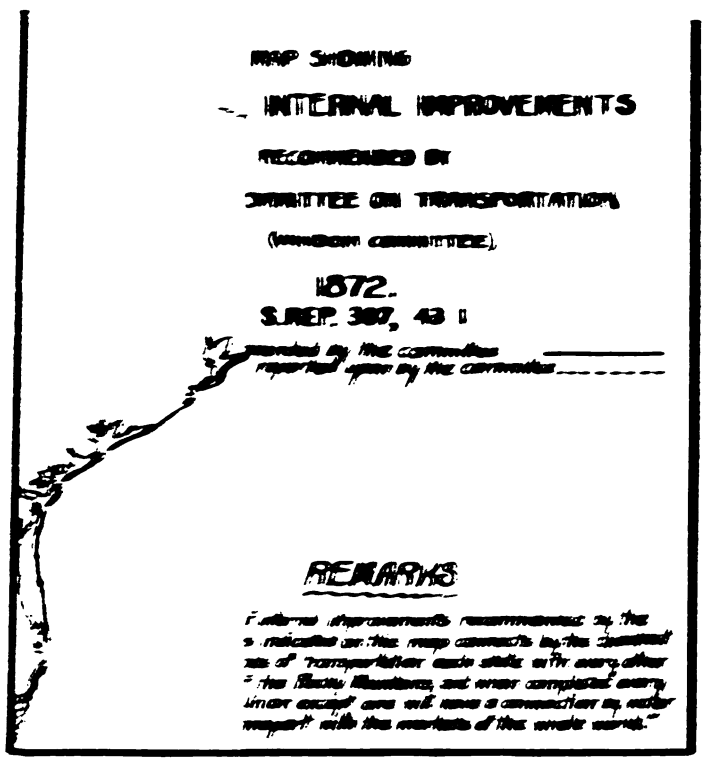
(WINDOM COMMITTEE)

1872.

S.REP. 387, 43 I

recorded by the committee _____

reported upon by the committee _____



REMARKS

"Internal improvements recommended by the committee indicated on this map connect by the shortest lines of transportation each state with every other in the Union, and when completed every union except one will have a connection by water transport with the markets of the whole world."

[illegible] of shipment on its line in one State to al. [illegible] in another State, including classifications and [illegible] rebates, reductions, and discriminations; 2d. A [illegible] statement of receipts and expenditures, including the [illegible] to officers, agents, and employes of the company; [illegible] of stock and bonds issued, the price at which they [illegible] disposition made of the funds received from such [illegible] amount and value of commodities transported during [illegible] as the same can be ascertained, together with such [illegible] be required by the head of such Bureau, under the [illegible]

[illegible] the existence of the Federal power to regulate com- [illegible] tent maintained in this report is believed to be essen- [illegible] maintenance of perfect equality among the States as to [illegible] ts; to the prevention of unjust and invidious distinc- [illegible] al jealousies or interests might be disposed to intro- [illegible] proper restraints of consolidated corporate power, and [illegible] on of many of its existing evils, yet your committee are [illegible] of the opinion that the problem of cheap transportation [illegible] through competition, as hereinafter stated, rather than [illegible] governmental regulation of existing lines.

[illegible] petition, which is to secure and maintain cheap transportation [illegible] embrace two essential conditions: first, it must be [illegible] by a power with which combination will be impossible, [illegible] operate through cheaper and more ample channels [illegible] than are now provided.

Railway competition, when regulated by its own laws will [illegible] the object; because it exists only to a very limited extent [illegible] localities; it is always unreliable and inefficient, and [illegible] combination. Hence, additional railroads [illegible] of private corporations, will affect [illegible] will inevitably lead them [illegible] long lines.

The only means of securing and maintaining [illegible] between railways is through national [illegible] of one or more lines, which, being [illegible] will serve [illegible] of other lines [illegible] railways, honest [illegible] the Government [illegible]

measures only as may be enacted with entire safety, reserving other matters of legislation for further inquiry and consideration. They therefore recommend for present action the following:

1. That all railway companies, freight-lines, and other persons, or organizations of common carriers, engaged in transporting passengers or freights from one State into or through another, be required, under proper penalties, to make publication at every point of shipment from one State to another, of their rates and fares, embracing all the particulars regarding distance, classifications, rates, special tariffs, drawbacks, &c., and that they be prohibited from increasing such rates above the limit named in the publication, without reasonable notice to the public, to be prescribed by law.

2. That combinations and consolidations with parallel or competing lines are evils of such magnitude as to demand prompt and vigorous measures for their prevention.

3. That all railway companies, freight-lines, and other organizations of common carriers, employed in transporting grain from one State into or through another, should be required, under proper regulations and penalties to be provided by law, to receipt for *quantity* and to deliver the same at its destination.

4. That all railway companies and freight organizations, receiving freights in one State to be delivered in another, and whose lines touch at any river or lake port, be prohibited from charging more to or from such port than for any greater distance on the same line.[a]

5. Stock-inflations, generally known as "stock-waterings," are wholly indefensible; but the remedy for this evil seems to fall peculiarly within the province of the States who have created the corporations from which such practices proceed. The evil is believed to be of such magnitude as to require prompt and efficient State action for its prevention, and to justify any measures that may be proper and within the range of national authority.

6. It is believed by the committee that great good would result from the passage of State laws prohibiting officers of railway companies from owning or holding, directly or indirectly, any interest in any "*non-co-operative* freight-line" or car company, operated upon the railroad with which they are connected in such official capacity.

7. For the purpose of procuring and laying before Congress and the country such complete and reliable information concerning the business of transportation and the wants of commerce, as will enable Congress to legislate intelligently upon the subject, it is recommended that a Bureau of Commerce, in one of the Executive Departments of the Government, be charged with the duty of collecting and reporting to Congress information concerning our internal trade and commerce; and be clothed with authority of law, under regulations to be prescribed by the head of such Department, to require each and every railway and other transportation company engaged in inter-State transportation to make a report, under oath of the proper officer of such company, at least once each year, which report should embrace, among other facts, the following, namely: 1st. The rates and fares

[a] This provision, it is believed, will prevent the discriminations now practiced against such ports, and will enable States which are separated from water-lines by intervening States to reach such lines at reasonable cost. Congress has no power to regulate commerce wholly within a State, and hence States bordering upon such water-lines will regulate the rates to ports within their own territory.

freight-railway portages under control of the Government, as the obvious and certain solution of the problem of *cheap* transportation.

Thirteenth. After a most careful consideration of the merits of various proposed improvements, taking into account the cost, practicability, and probable advantages of each, the Committee have come to the unanimous conclusion that the following are the most feasible and advantageous channels of commerce to be created or improved by the National Government in case Congress shall act upon this subject, viz:

1st. The Mississippi River.

2d. A continuous water-line of adequate capacity from the Mississippi River to the city of New York, via the northern lakes.

3d. A route adequate to the wants of commerce, through the central tier of States, from the Mississippi River, via the Ohio and Kanawha Rivers, to a point in West Virginia, and thence by canal and slack-water, or by a freight-railway, to tide-water, in Virginia.

4th. A route from the Mississippi River, via the Ohio and Tennessee Rivers, to a point in Alabama or Tennessee, and thence by canal and slack-water, or by a freight-railway, to the ocean.

In the discussion of these four existing and proposed channels of commerce, we shall, for the sake of brevity, designate them respectively, the "Mississippi route," "Northern route," "Central route," and "Southern route."

THE MISSISSIPPI ROUTE.

The improvements necessary on the Mississippi route are: 1. The opening of the mouth of the river, so as to permit the free passage of vessels drawing 28 feet—estimated cost, $10,000,000. 2. The construction of reservoirs at the sources of the river—(if upon a careful survey they shall be deemed practicable)—estimated cost, $114,000. 3. Improvements upon a system to be provided by the War Department, at all intermediate points, so as to give from 3 to 5 feet navigation above the Falls of Saint Anthony; from 4½ to 6 feet from that point to Saint Louis; and from 8 to 10 feet from Saint Louis to New Orleans, at the lowest stages of water; estimated cost, $5,000,000.

The total cost of the Mississippi improvements may, we think, be safely estimated at $16,000,000.

THE NORTHERN ROUTE.

The improvements suggested on this route are:

1st. The Fox and Wisconsin Rivers improvement, by which 5 feet of navigation will be secured, during the entire season, from the Mississippi River to Green Bay, thereby affording the shortest and cheapest connection between the centers of wheat production and the eastern markets, and a continuous water-channel from all points on the Mississippi River and its tributaries to the Atlantic Ocean. Estimated cost, $3,000,000.

2d. The construction of the Hennepin Canal (65 miles long) from a point on the Mississippi River, near Rock Island, to the Illinois River at Hennepin, thereby affording the shortest and cheapest route from the largest areas of greatest corn production to the East, and a connection by water between the river system of the West, the northern lakes, and the Atlantic Ocean. Estimated cost, $4,000,000.

3d. The enlargement and improvement, with the concurrence of the State of New York, of one or more of the three water-routes from the lakes to New York City, namely: The Erie Canal from Buffalo to Albany; the Oneida Lake Canal from Oswego to Albany; or the Champlain Canal from Lake Champlain to deep water on the Hudson River, including such connection as may be effected between Lake Champlain and the Saint Lawrence River with the co-operation of the British Provinces. Estimated cost, $12,000,000.

Total cost of northern route from the Mississippi River to New York City, $19,000,000.

The enlargement of the Welland Canal, now in progress, with the construction of the Caughnawaga Canal, and the proposed enlargement of the Champlain Canal, will enable vessels of a 1,000 tons to pass from western lake ports to ports in Vermont and to New York City. The Erie Canal, enlarged as proposed, will pass vessels of about 700 tons.

THE CENTRAL ROUTE.

The plan of improvement for this route contemplates—

1st. The radical improvement of the Ohio River from Cairo to Pittsburgh, so as to give six to seven feet of navigation at low water. Estimated cost, $22,000,000.

2d. The improvement of the Kanawha River from its mouth to Great Falls, so as to give six feet of navigation at all seasons. Estimated cost, including reservoirs, $3,000,000.

3d. A connection by canal or by a freight-railway from the Ohio River or Kanawha River, near Charleston, by the shortest and most practicable route, through West Virginia, to tide-water in Virginia; the question as between the canal and freight-railway to be decided after the completion of careful surveys and estimates. If by canal and slack-water, the estimated cost is $55,000,000; if by a freight-railway, the cost would probably not exceed $25,000,000.

The total expenditure necessary for the improvement of the Ohio and Kanawha Rivers is estimated at $25,000,000. The amount necessary to complete the connection with tide-water depends upon the nature of the improvement, as above stated.

THE SOUTHERN ROUTE.

The plan suggested by the committee for the southern route contemplates: 1. The improvement of the Tennessee River from its mouth to Knoxville, so as to give 3 feet of navigation at lowest stages of water. Estimated cost, $5,000,000. 2. A communication by canal, or freight-railway, from some convenient point on the Tennessee River in Alabama or Tennessee, by the shortest and most practicable route to the Atlantic Ocean. The railway, if constructed, will be about 430 miles long; the question as between the canal and railway to be decided after a careful survey and estimate of both shall have been completed. If by canal, the cost will be about $35,000,000. If by railway, probably about $30,000,000. Large portions of all of the above routes have been surveyed, and careful estimates prepared by the War Department. It is recommended that appropriations be made at the present session of Congress, for

completing the surveys of the entire system of improvements proposed, in order to determine accurately the cost of each route, and to enable the Government to enter at once upon the work, if the same shall be deemed practicable and expedient, after such surveys shall have been completed.

In presenting this general plan of improvements, the committee wish it to be distinctly understood that the ordinary annual appropriations for other important works, in aid of commerce, should not be omitted.

The cost of the entire improvement will depend upon the decision to be hereafter made between the canals and the freight-railway portages on the central and southern routes. If the canals be constructed, the total cost will be about $155,000,000. If the railways be chosen, the total cost will be about $120,000,000.

An actual expenditure of $20,000,000 to $25,000,000 per annum will be required for five years, (in addition to the loan of Government credit as above stated,) when the whole work can be completed. The resulting benefits will, for all time, annually repay more than double the entire cost.

In view of the fact that private companies invariably combine with each other against the public, it is recommended that no aid be given to any route to be owned or controlled by private corporations, but that the four great channels of commerce suggested shall be improved, created, and owned by the Government, and stand as permanent and effective competitors with each other, and with all the railways which may be within the range of their influence.

The committee believe that the water-routes suggested should constitute free highways of commerce, subject only to such tolls as may be necessary for maintenance and repairs. If, however, Congress shall deem it expedient to require them to provide interest on the cost of construction, and the means for ultimate redemption of the principal, the whole improvements will involve only a loan of Government credit.

NATIONAL CHARACTER OF THE PROPOSED IMPROVEMENTS.

By reference to the map of the United States it will be seen that the completion of the system of improvements proposed will provide four great competing commercial lines from the center of the continent to the Atlantic seaboard and the Gulf of Mexico. It will also be observed, by reference to the crop-maps republished with this report, that these routes lead directly from, or through, the greatest areas of production, to those sections which constitute the greatest areas of consumption; thus dividing their benefits equitably between producers and consumers, and contributing to the development and prosperity of the whole country. The Great Architect of the continent seems to have located its rivers and lakes with express reference to the commercial necessities of the industrious millions who now and shall hereafter occupy it. The plan of improvements suggested by the committee merely follows the lines so clearly indicated by His hand.

The proposed improvements are so located as to distribute their benefits with great equality among all the States east of the Rocky Mountains. Twenty-one of those States are situated directly on one

or more of said routes; two States—Kansas and Nebraska—are so situated as to enjoy the full benefits of reduced cost of transportation from the Mississippi River by all of the proposed lines. Eleven States, viz, Maine, New Hampshire, Massachusetts, Connecticut, Rhode Island, Delaware, Maryland, New Jersey, North Carolina, Florida, and Texas, nearly all of which consume largely the food of the West, and most of which are to a great extent dependent upon the West for a market for their manufactures and other products, are directly connected by the waters of the ocean with their several termini. The proposed improvements will, therefore, connect by the cheapest known means of transport every one of the thirty-four States, east of the Rocky Mountains, with all the others, and but one State in the Union will be without water connection with the whole world. The accomplishment of so great a result, by an expenditure of money comparatively so small, illustrates the wonderful provisions of nature for cheap commercial facilities on this continent.

These four great channels of commerce under public control, and hence unable to combine with each other or with existing lines of transport, will, by the power of competition, hold in check all the railways radiating from the interior to the seaboard, and, by affording cheap and ample means of communication, will solve the problem of cheap transportation. If local railways discriminate against them, it will be in the power of the States whose boundaries they touch to prescribe regulations for the correction of such discriminations. A law of Congress prohibiting discriminations against river or lake ports, will enable the other States not directly upon any of said lines to reach them at reasonable rates. The committee submit that no scheme of public improvement could be more eminently national in its character, nor diffuse its benefits more generally and equitably, than the one proposed, and they believe that the entire system of improvements indicated should be considered and acted upon as a whole.

Let us now consider more specifically the benefits and advantages to be anticipated from each route and from the entire system, when completed.

BENEFITS ANTICIPATED FROM THE NORTHERN ROUTE.

From all points on the Mississippi River between Minneapolis, Minn., and Quincy, Ill., the average railway rate to lake ports in 1872 was 17 cents per bushel of 60 pounds. From Chicago to New York, by rail, the average charge during that year was 33½ cents per bushel, and the average rate by water was 26$\frac{6}{10}$ cents per bushel, making the all-rail charges through from the Mississippi to New York 50½ cents, and the rail and water charges, exclusive of terminals, 43$\frac{6}{10}$ cents per bushel. In the section of this report devoted to the Fox and Wisconsin River Improvement, and the Hennepin Canal, we have shown that an average saving can be effected through their agency, of at least 10 cents per bushel on all the cereals transported from points west of the Mississippi River and north of the southern line of Iowa. It is believed by those who have studied the subject that the enlargement of the New York canals so as to pass boats of 600 to 1,000 tons will reduce the cost of transportation on that part of the line 50 per cent. The establishment of reciprocal trade relations with the

Dominion of Canada, which shall induce the construction of the Caughnawaga Canal (if such an arrangement can be made), and which will encourage Canadian shipmasters to compete for the carrying trade on the lakes, will also materially cheapen the cost of transport to New England. The evidence taken by your committee fully justifies the opinion that by the enlargement of the New York canals, the construction of the Caughnawaga Canal, and the use of the enlarged Canadian canals, the cost of transport from Chicago to Burlington, Vt., and to New York City will not exceed from 12 to 15 cents per bushel, making the entire cost from the Mississippi River to Burlington, Vt., or to New York, not more than 22 cents per bushel, against the present cost of 43$\frac{6}{10}$ cents by water, and 50½ cents by rail. We may, therefore, reasonably estimate that by the proposed improvements upon this route a saving can be effected of 20 cents per bushel, or $6.70 per ton, on all the east tonnage moved between that river and the East.

BENEFITS ANTICIPATED FROM THE CENTRAL ROUTE.

Assuming a charge of 4 mills per ton per mile on the Mississippi River, and on the improved Ohio and Kanawha Rivers,[a] a charge of 8 mills per ton per mile on the James River and Kanawha Canal, and 6 mills per ton per mile on the slack-water improvement, the following statement will represent the cost of transport from Cairo, Ill., to Richmond, Va., by the central water line:

Cairo to Great Falls of the Kanawha, 790 miles, 4 mills per ton per mile	$3.16
From Great Falls to Richmond the distance (equating each lock at one-half mile of canal) is 509 miles, of which 348 is canal (equated) and 161 is slack water.	
348 miles canal, at 8 mills per ton per mile	2.78
161 miles of slack-water, at 6 mills per ton per mile	.96
Total per ton for entire distance	[b] 6.90

Equal to 20.4 cents per bushel of 60 pounds.

If the freight railway from the Kanawha to tide-water be adopted, instead of the canal and slack-water improvement, the cost of transport from the Ohio River to the ocean will, it is believed, be substantially the same as above stated.

The central route would be closed by ice only about 30 days each year, and hence it would be an active competitor with all the railways from the Mississippi River to the Atlantic at times when competition is now suspended by reason of frost on the northern water-route. The effect of such a regulator of railway charges would be to greatly reduce the present winter rates, and by the constant competition it would maintain to compel uniformly low charges on all rail and water lines from the interior to the eastern and southern seaboard. Its advantages would be greatest, however, to the central

[a] The evidence taken by the Committee, and already stated in this report, shows that the average charges by the Ohio and Mississippi Rivers is now only from 3½ to 4½ mills per ton per mile, and in many cases only 2 mills.

[b] It is due to this route to say that the above estimates of cost are fully 50 per cent. higher than those relied upon by its advocates. The Committee have adopted them from superabundant caution, preferring to understate the benefits to be anticipated from all the routes, rather than to exaggerate them. The successful application of steam as a motor on canals will doubtless reduce the cost of transport by this line very much below the figures named.

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the cost from Saint Paul will not exceed 17 cents. The average rate from New Orleans to Liverpool in 1872 was about 27 cents, (currency,) which can be reduced, as hereinbefore shown, to 18 or 20 cents by the improvement at the mouth of the river. Estimating the cost from Saint Paul to New Orleans at 17 cents, the two transfers at Saint Louis and New Orleans at 1 cent each, and the charge from New Orleans to Liverpool at 20 cents, the total from Saint Paul to Liverpool will be 39 cents per bushel. The charge in 1872 from Saint Paul to Liverpool, including transfers and terminals at Chicago, Buffalo, and New York, by the cheapest route, averaged 67.5 cents per bushel. The saving to be effected by the improvements of this route may therefore be estimated at 28 cents per bushel from Saint Paul to Liverpool, with a proportionate reduction from all other points on the river.

In view of the benefits and advantages to be derived from each of the four proposed routes, and from their combined influence when in constant competition with each other, and with the railroad-system of the country, it is, in the judgment of your Committee, entirely safe to say that the completion of the system of improvements suggested will effect a permanent reduction of 50 per cent. in the cost of transporting fourth-class freights from the valley of the Mississippi to the seaboard, and that the cost of carrying a bushel of wheat or corn to the markets of the East, and of the world, will be reduced at least 20 to 25 cents per bushel below the present railway-charges, and that a similar reduction will be effected on return-freights.

The actual movement of grain to the eastern and southern markets in 1872, as shown by the carefully prepared statistics submitted with this report, amounted to about 213,000,000 bushels. An average saving of 20 cents per bushel on the surplus moved that year would have amounted to over $42,000,000, or more than two-thirds of the entire expenditure necessary to complete the proposed routes, in addition to the loan of Government credit as before stated. But for the fact that large quantities of corn were unable to find a market, on account of the high transportation-charges, the amount moved would have been very much greater. Hence, in addition to the saving in transportation above named, a benefit perhaps equally great would have been conferred upon the producer in affording him a market for his surplus products.

To this must be added the enhanced value which such reduction would give to the improved lands of the West, amounting, in the eight Northwestern States of Indiana, Illinois, Iowa, Minnesota, Wisconsin, Missouri, Kansas, and Nebraska, in 1870, to 55,841,000 acres. Estimating the productive capacity of these lands at an average of only twenty bushels per acre, (the average of corn, oats, &c., being, in fact, very much greater,) an addition of only ten cents per bushel (one-half the estimated saving) to the value of the cereals those States are capable of producing, would give a net profit of $2 per acre, which is the equivalent of ten per cent. interest on a capital of $20, and hence equal to an increase in the value of lands to that extent. Twenty dollars per acre, added to the value of improved lands in those States, would exceed an aggregate of $1,100,000,000. This calculation assumes that one-half of the reduction will inure to the benefit of the consumer and the other half to the producer.

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for grain. The effect upon our cotton exportations is shown by the following statement:

Receipts of cotton in Great Britain in 1860 compared with 1872.

1860.		1872.	
From—	Cotton.	From—	Cotton.
	Pounds.		*Pounds.*
United States	1,115,890,608	United States	625,600,080
All other countries	275,048,144	All other countries	783,237,392

Our cotton exports have fallen off nearly 50 per cent., while other countries have gained nearly 300 per cent. This is doubtless largely due to the war, which stimulated the production of cotton in India; but it is also attributable to a great extent to the causes above mentioned, and to the system of internal improvements inaugurated by Great Britain in India, for the express purpose of rendering herself independent of us for the supply of cotton. Every cent unnecessarily added to the cost of transportation is to that extent a protection to the cotton-planters of India and the food-producers of Russia, against the farmers of the West and the cotton-planters of the South.

The cry of despair which comes from the over-burdened West, the demand for cheaper food heard from the laboring classes at the East and from the plantations of the South, and the rapid falling off of our principal articles of export, all indicate the imperative necessity for cheaper means of internal communication. If we would assure our imperiled position in the markets of the world, re-instate our credit abroad, restore confidence and prosperity at home, and provide for a return to specie payment, let us develop our unequaled resources and stimulate our industries by a judicious system of internal improvements.

A reference to the expenditures of our Government since the adoption of the Constitution will show that in some matters we have been sufficiently liberal, but in appropriations for the benefit of commerce and for the development of our vast resources, most parsimonious. For public buildings, including those in the District of Columbia, and custom-houses, post-offices, and court-houses in other parts of the country, we have expended over $62,000,000; while for the improvement of the 20,000 miles of western rivers, through which should flow the life-currents of the nation, we have appropriated only $11,438,300. For the improvement of these great avenues of trade, which were designed by nature to afford the cheapest and most ample commercial facilities for the teeming millions who inhabit the richest country on the earth, we have expended an average of $133,100 per annum; while for public buildings we have appropriated an average of over $750,000 a year. Is it not high time that all expenditures not absolutely necessary be suspended, and that the imperative necessities of the country receive attention?

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I concur in the main in the foregoing report, prepared by the chairman; it contains, however, certain statements and assertions of law and of fact, and recommendations relative to the power of Congress and its exercise, from which I dissent.

ROSCOE CONKLING.

The undersigned, members of the committee, do not agree that Congress can exercise the power "to regulate commerce among the several States", to the extent asserted in this report.

T. M. NORWOOD.
H. G. DAVIS.
JOHN W. JOHNSTON.

19. STATUTES RELATING TO WATER POWER

By Alexander Mackenzie

Brigadier-General, U. S. Army, Chief of Engineers

Data obtained by searches suggested by general references cited in indexes to various statutes

Abstract of legislation enacted by Congress in relation to the construction of power dams, etc., in the navigable waters of the United States between 1789 and December 6, 1908.[a]

Location of dam, etc.	Name of grantee, etc.	Date of Congressional act.	Reference to volume and page of United States Statutes at Large.
1. General act for construction of dams across navigable waters.	.....	June 21, 1906	Vol. 34, p. 386. (Public, No. 262.)
2. Bear River, Miss.....	North Mississippi Traction Co.	Apr. 23, 1906	Vol. 34, p. 130. (Public, No. 119.)
3. Bear River, Miss.....	Andrews & Jourdan.....	Feb. 25, 1907	Vol. 34, p. 929. (Public, No. 115.)
4. Black Warrior River, Ala. (Mulberry Fork).	T. H. Friel.....	Mar. 16, 1908	Vol. 35, p. 45. (Public, No. 59.)
5. Cahaba River, Ala. (Centerville).	Cahaba Power Co.....	Mar. 6, 1908	Vol. 35, p. 37. (Public, No. 38.)
6. Choctawhatchee River (Newton, Ala.).	Choctawhatchee Power Co.	Apr. 5, 1906	Vol. 34, p. 102. (Public, No. 84.)
7. Choctawhatchee River, Ala. (below Newton-Ozark road).	Andrew J. Smith et al.....	Mar. 10, 1908	Vol. 35, p. 40. (Public, No. 47.)
8. Coosa River, Alabama (Lock No. 2).	Riparian owners.....	May 9, 1906	Vol. 34, p. 183. (Public, No. 150.)
9. Coosa River, Ala. (Dam No. 4). Completion of Government dam and use of water power by private parties.	Riparian owners, etc.....	June 4, 1906	Vol. 34, p. 211. (Public, No. 196.)
10. Coosa River, Ala. (Dam No. 12).	Alabama Power Co.....	Mar. 4, 1907	Vol. 34, p. 1288. (Public, No. 247.)
11. Crow Wing River, Minn..	Judd Wright.....	June 16, 1906	Vol. 34, p. 296. (Public, No. 238.)
12. Cumberland River and its South Fork above Burnside, Ky.	Cumberland River Improvement Co.	Mar. 3, 1905	Vol. 33, pp. 1132, 1133. (Public, No. 215, pp. 18 (pars. 1 to 6) and 19 (par. 1).)
13. Cumberland River (Dam No. 1, above Nashville, Tenn.). Leasing of water power created by the Government dam.	.....	June 13, 1902 June 28, 1902	Vol. 32, p. 358. (Public, No. 154, p. 31, par. 3.) Vol. 32, p. 408. (Public, No. 180.)
14. Flint River, Ga. (Porter shoals).	Albany Power and Manufacturing Co.	Feb. 5, 1907	Vol. 34, p. 878. (Public, No. 62.)
15. Forest reserves (in and across.) Under Department of Agriculture.	Private parties, etc.....	Feb. 1, 1905	Vol. 33, p. 628. (Public, No. 34.)
16. Goose Creek, S. C.....	Charleston Light and Water Co.	June 14, 1906	Vol. 34, p. 265. (Public, No. 230.)
17. Kansas (Kaw) River, Kans.	Chicago-Topeka Light, Heat and Power Co.	Jan. 22, 1894	Vol. 28, p. 27. (Public, No. 14.)
18. Kansas (Kaw) River, Kans.	Topeka Water and Electric Power Co.	June 6, 1892	Vol. 27, p. 46. (Public, No. 77.)
19. Klamath Indian Reservation, Oreg. Indian appropriation act, under Department of the Interior.	Private parties.....	June 21, 1906	Vol. 34, pp. 325 and 368. (Public, No. 258.)
20. Little River, Ala. (Blanche). Power plant.	Henry T. Henderson et al..	June 30, 1906	Vol. 34, p. 818. (Public, No. 408.)
21. Mississippi River (Bemidji, Minn.).	Kirby Thomas et al.....	Mar. 3, 1905 Feb. 1, 1908	Vol. 33, p. 1043. (Public, No. 207.) Vol. 35, p. 3. (Public, No. 8.)

[a] This list does not include cases in which dams appear to have been intended for purposes otherwise than for the generation of mechanical power.

Abstract of legislation enacted by Congress in relation to the construction of power dams, etc., in the navigable waters of the United States between 1789 and December 6, 1908—Cont'd

Location of dam, etc.	Name of grantee, etc.	Date of Congressional act.	Reference to volume and page of United States Statutes at Large.
22. Mississippi River (Bemidji, Minn.).	Morrison & Haines	June 4, 1906	Vol. 34, p. 210. (Public, No. 194.)
23. Mississippi River (Brainerd, Minn.).	Mississippi Water Power and Boom Co.	Apr. 15, 1886	Vol. 24, p. 12.
24. Mississippi River (Clearwater, Minn.).	The Mississippi River Power Co.	June 14, 1906 Mar. 2, 1907	Vol. 34, p. 266. (Public, No. 231.) Vol. 34, p. 1235. (Public, No. 205.)
25. Mississippi River (Des Moines Rapids).	Des Moines Rapids Power Co.	Feb. 24, 1894	Vol. 28, p. 38. (Public, No. 28.)
26. Mississippi River (Des Moines Rapids at Keokuk, Iowa).	Keokuk and Hamilton Water Power Co.	Feb. 8, 1901 Feb. 26, 1904 Feb. 9, 1905	Vol. 31, p. 764. (Public, No. 43.) Vol. 33, p. 56. (Public, No. 32.) Vol. 33, p. 712. (Public, No. 65.)
27. Mississippi River (Grand Rapids, Minn.).	Grand Rapids Water Power and Boom Co.	Feb. 27, 1899 Feb. 27, 1900	Vol. 30, p. 904. (Public, No. 80.) Vol. 31, p. 33. (Public, No. 26.)
28. Mississippi River (Little Falls, Minn.).	Little Falls Water Power Co.	July 3, 1886	Vol. 24, p. 123.
29. Mississippi River (Minneapolis, Minn., to Coon Rapids).	Twin City Rapid Transit Co.	Mar. 5, 1898 Apr. 12, 1900	Vol. 30, p. 253. (Public, No. 28.) Vol. 31, p. 75. (Public, No. 67.)
30. Mississippi River (Minneapolis to St. Paul). Commission to report concerning use of surplus water flowing over Government dams.	.....	June 25, 1906	Vol. 34, p. 466. (Public, No. 282.)
31. Mississippi River (Monticello, Minn.).	The Mississippi River Power Co.	June 14, 1906 Mar. 2, 1907	Vol. 34, p. 264. (Public, No. 229.) Vol. 34, p. 1235. (Public, No. 204.)
32. Mississippi River (in Morrison Co.).	The Pike Rapids Power Co.	June 4, 1906 Mar. 2, 1907	Vol. 34, p. 209. (Public, No. 193.) Vol. 34, p. 1219. (Public, No. 179.)
33. Mississippi River (Otsego, Minn., between Wright and Sherburne counties).	Minnesota Power and Trolley Co.	Mar. 12, 1904 Mar. 22, 1906	Vol. 33, p. 66. (Public, No. 47.) Vol. 34, p. 84. (Public, No. 63.)
34 Mississippi River (Rock Island, Ill.).[a]			
35. Mississippi River (Rock Island Rapids, between Davenport and Le Claire, Iowa).	Davenport Water Power Co.	Apr. 5, 1904 Feb. 5, 1907	Vol. 33, p. 158. (Public, No. 82.) Vol. 34, p. 876. (Public, No. 56.)
36. Mississippi River (Sauk Rapids, St. Cloud, Minn.).	St. Cloud Water Power & Mill Co.	July 5, 1884	Vol. 23, p. 154.
37. Mississippi River (village of Sauk Rapids, Minn.).	Sauk Rapids Water Power Co.	Feb. 26, 1904 Mar. 2, 1907	Vol. 33, p. 52. (Public, No. 28.) Vol. 34, p. 1058. (Public, No. 164.)
38. Mississippi River (Sauk Rapids, between village of Sauk Rapids and St. Cloud, Minn.).	Sauk Rapids Manufacturing Co.	Feb. 20, 1905	Vol. 33, p. 723. (Public, No. 83.)
39. Mississippi River (between Stearns and Sherburne counties, Minn., at Augusta).	The St. Cloud Electric Power Co.	June 28, 1906	Vol. 34, p. 537. (Public, No. 315.)
40. Mississippi River (Watab, Minn.).	Watab Rapids Power Co.	Apr. 23, 1904	Vol. 33, p. 295. (Public, No. 151.)
41. Missouri River (Fort Benton, Mont., somewhere within a distance of 30 miles above).	Missouri River Improvement Co.	Feb. 20, 1907	Vol. 34, p. 912. (Public, No. 98.)

[a] Dam authorized in 1837 by charter of State of Illinois to private parties; charter extended by State in 1839. Developed by Moline Water Power Co. et al. Further developed by Ordnance Department, U. S. Army, under authority of acts of Congress of Apr. 19, 1864 (vol. 13, p. 50), and June 27, 1866 (vol. 14, pp. 75 and 76). See also in this connection joint resolutions of Congress of Mar. 2, 1867 (vol. 14, p. 573), and Mar. 3, 1877 (vol. 19, p. 410), act of Congress of Mar. 3, 1879 (vol. 20, p. 387, first paragraph), and joint resolution of Congress of June 20, 1879 (vol. 21, p. 51). For history of operations by Ordnance Department concerning the development of this water power see "A history of the Rock Island Arsenal," etc., 1877, published by the Ordnance Department, U. S. Army.

Statement of legislation enacted by Congress in relation to the construction of power dams, etc., in the navigable waters of the United States between December 4, 1906, and June 4.

Location of dam, etc.	Name of grantee, etc.	Date of Congressional act.	Reference to volume and page of United States Statutes at Large.
1. Missouri River, Fort Benton, Mont.	Fort Benton Power Co.	Apr. 28, 1906	Vol. 34, p. 158. Public, No. 153.
		Mar. 4, 1907	Vol. 34, p. 1415. Public, No. [illegible]
2. Missouri River, Helena Valley irrigation district, authority for construction of dams.		June 4, 1906	Vol. 34, p. 225. Public, No. 175, p. 14, par. 1.
3. Missouri River, near Helena Valley, Mont.	Missouri River Power Co.	June 4, 1906	Vol. 34, p. 14. Public, No. 46.
4. Missouri River, vicinity of Great Falls, Mont.	Great Falls Improvement Co.	Apr. 21, 1906	Vol. 34, p. 221. Public, No. 161.
5. New River, Va., and W. Va., at Sparrows Creek, Va.	James a. Ruffin	June 4, 1906	Vol. 34, p. 164. Public, No. 182.
6. Niagara River, near Niagara Falls, Niagara Mill-race development.	J. E. Dwyer	June 29, 1906	Vol. 34, p. 587. Public, No. 238.
7. Osage River, Mo., Warsaw	City of Warsaw	Jan. 14, 1907	Vol. 34, p. 779. Public, No. [illegible]
8. Pee Dee River, Ellerbe	Pee Dee Power Co.	Feb. 23, 1906	Vol. 34, p. 28. Public, No. 31.
9. Pend d'Oreille River, Wash., Big or Metaline Falls	Pend d'Oreille Development Co.	June 1, 1906	Vol. 34, p. 215. Public, No. 187.
10. Pend d'Oreille River, Wash., near Pierson Creek	do	Jan. 25, 1907	Vol. 34, p. 801. Public, No. [illegible].
		May 4, 1908	Vol. 35, p. 158. Public, No. 69.
		May 4, 1908	Vol. 35, p. 167. Public, No. 69.
11. Rainy River, Minn.	Rainy River Improvement Co.	June 29, 1905	Vol. 33, p. 685. Public, No. 240.
		Feb. 25, 1905	Vol. 33, p. 854. Public, No. 112.
		May 21, 1908	Vol. 35, p. 253. Public, No. 238.
12. Red Lake River, Minn.	W. J. Murphy	Mar. 16, 1906	Vol. 34, p. 46. Public, No. 46.
13. Rock River, Ill., Grand Detour	A. B. Sweberry et al.	Jan. 10, 1906	Vol. 34, p. 54. Public, No. 16.
14. Rock River, Ill., Dixon	Stewart a. Smith et al.	Mar. 1, 1905	Vol. 33, p. 1084. Public, No. [illegible]
15. Rock River, Ill., Dixon	do	Jan. 25, 1907	Vol. 34, p. 803. Public, No. 224.
16. Rock River, Ill., at Janesville and at Beloit	A. A. Jones	May 1, 1906	Vol. 34, p. 158. Public, No. 217.
17. Rock River, Ill., Sterling Rock Falls	Sterling Hydraulic Co.	Mar. 1, 1907	Vol. 34, p. 1088. Public, No. 188, p. 22, par. 1.
18. St. Croix River, Wis. and Minn., St. Croix Falls, Wis.	St. Croix Falls Wisconsin Improvement Co. and St. Croix Falls Minnesota Improvement Co.	Jan. 7, 1908	Vol. 35, p. 402. Public, No. 44.
19. St. Joseph River, Mich., Berrien Springs	Berrien Springs Power & Electric Co.	Apr. 1, 1906	Vol. 34, p. 108. Public, No. 45.
20. St. Joseph River, Mich., Mottville	E. L. Barnhart	Mar. 1, 1907	Vol. 34, p. 1254. Public, No. 189.
21. Savannah River, Ga. and S. C., Augusta	J. B. Lane Development Co.	do	Vol. 34, p. 1268. Public, No. 214.
22. Savannah River, Ga. and S. C., Calhoun Falls	High Market Co.	do	Vol. 34, p. 1268. Public, No. [illegible]
23. Savannah River, Ga. and S. C., Stevens Shoals	do	do	Vol. 34, p. 1268. Public, No. 230.
24. Savannah River, Ga., Augusta, at Lawrence Creek, Power Canal, and Jackson Bluff.	Twin City Power Co.	Jan. 4, 1907	Vol. 34, p. 762. Public, No. 6.
		Jan. 27, 1907	Vol. 34, p. 1000. Public, No. 186.
		Feb. 19, 1908	Vol. 35, p. 16. Public, No. 18.
25. Savannah River, Ga., Trotter Shoals	Savannah River Power Co.	Jan. 1, 1907	Vol. 34, p. 679. Public, No. 16.
26. Savannah River, Ga. and S. C., Hamilton Ford	High Market Co.	Mar. 1, 1907	Vol. 34, p. 1268. Public, No. 212.
27. Savannah River, Ga. and S. C., McCormick Shoals	American Finance and Trust Co.	do	Vol. 34, p. 1269. Public, No. 209.
28. Savannah River, Ga. and S. C., Middleton Shoals	do	do	Vol. 34, p. 1269. Public, No. 211.

Abstract of legislation enacted by Congress in relation to the construction of power dams, etc., in the navigable waters of the United States between 1789 and December 6, 1908—Cont'd

Location of dam, etc.	Name of grantee, etc.	Date of Congressional act.	Reference to volume and page of United States Statutes at Large.
70. Savannah River, Ga. and S. C. (Trotters shoals).	Hugh MacRae Co.....	Mar. 2, 1907	Vol. 34, p. 1241. (Public, No. 215.)
71. Savannah River, Ga. and S. C. (Turner shoals).	Anderson Guaranty and Trust Co.	.....do.....	Vol. 34, p. 1239. (Public, No. 209.)
72. Spokane River, Wash. Under Department of the Interior.	Private parties.....	Mar. 3, 1905	Vol. 33, p. 1006. (Public, No. 173.)
73. Tennessee River, Ala. (Elk River shoals to Florence).	Report by a Board of Engineers called for.	Mar. 2, 1907	Vol. 34, p. 1094. (Public, No. 168, p. 23, par. 5.)
74. Tennessee River, Ala. (Hales bar, near Scott Point). The provisions of the last two acts cited are merely appropriations for certain work assumed by the General Government.	City of Chattanooga etc., and Chattanooga and Tennessee River Power Co.	Apr. 26, 1904	Vol. 33, p. 309. (Public, No. 109.)
		Jan. 7, 1905	Vol. 33, p. 603. (Public, No. 6.)
		Mar. 3, 1905	Vol. 33, p. 1133. (Public, No. 215, p. 19, par. 5.)
		Mar. 2, 1907	Vol. 34, p. 1093. (Public, No. 168, p. 23, par. 4.)
75. Tennessee River, Ala. (Muscle shoals).	General authority for construction of dams.	Mar. 6, 1906	Vol. 34, p. 52. (Public, No. 35.)
		Mar. 2, 1907	Vol. 34, p. 1094. (Public, No. 168, p. 23, par. 5.)
		Mar. 3, 1899	Vol. 30, p. 1351. (Public, No. 201.)
		June 6, 1900	Vol. 31, p. 274. (Public, No. 151.)
76. Tennessee River, Ala. (Muscle shoals).	Muscle Shoals Power Co...	Mar. 1, 1901	Vol. 31, p 846. (Public, No. 108.)
		Feb. 18, 1903	Vol. 32, p. 839. (Public, No. 96.)
Tugaloo River (Hattons Ford). *See* Savannah River (67), *supra*.			
77. Wabash River or tributaries Ill. (above Grand Rapids dam). To draw water by canal, flume, or race.	Mount Carmel Development Co.	Feb. 14, 1889	Vol. 25, p. 670.
		Feb. 12, 1901	Vol. 31, p. 785.
78. White River, Ark. (Lock and Dam No. 1). For canals, power stations, etc.	Batesville Power Co.....	June 28, 1906	Vol. 34, p. 536. (Public, No. 313.)
79. White River, Ark. (above Lock No. 3).	J. A. Omberg, jr.....	June 29, 1906	Vol. 34, p. 628. (Public, No. 368.)

(1)

June 21, 1906.
Vol. 34, p. 386.

[H. R. 8428.]
[Public, No. 262.]

CHAP. 3508.—An Act To regulate the construction of dams across navigable waters.

Dams.
Regulations for constructing, over navigable waters.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That when, hereafter, authority is granted by Congress to any persons to construct and maintain a dam for water power or other purposes across any of the navigable waters of the United States, such dams [*sic*] shall not be built or commenced until the plans and specifications for its construction, together with such drawings of the proposed construction and such map of the proposed location as may be required for a full understanding of the subject, have been submitted to the Secretary of War and Chief of Engineers for their approval, or until they shall have approved such plans and specifications and the loca-

Approval of Secretary of War and Chief of Engineers.
Changes.

[illegible] of such dam and appurtenant works and when the plans for any dam to be constructed under the provisions of this Act have been approved by the Chief of Engineers and by the Secretary of War it shall not be lawful to depart from such plans either before or after completion of the structure unless the modification of such plans has previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War. *Provided*, That in approving such plans and fixing such conditions and stipulations may be imposed as the Chief of Engineers and the Secretary of War may deem necessary to protect the present and future interests of the United States, which may include the condition that such persons shall construct, maintain, and operate, without expense to the United States, in connection with such dam and appurtenant works, a lock or locks, locks, or any other structures which the Secretary of War and the Chief of Engineers at any time may deem necessary in the interest of navigation, in accordance with such plans as they may approve, and also that whenever Congress shall authorize the construction of a lock or other structures for navigation purposes, in connection with such dam, the owner of such dam shall convey to the United States, free of cost, title to such land as may be required for such construction and appurtenances, and shall grant to the United States a free use of water power for building and operating such construction. *Conditions.* *Appurtenances, etc., at locks.* *Water power.*

SEC. 2. That the right is hereby granted to the United States to construct, maintain, and operate, in connection with any dam built under the provisions of this Act, a suitable lock or locks or any other structures for navigation purposes, and to build upon the dam and the ends of the piers thereof such lock or locks as shall be adjudged by the Secretary of War to be necessary to provide for navigation. *Right reserved for navigation.*

SEC. 3. That the owner, or corporation holding, maintaining, or operating any dam and appurtenant works under the provisions of this Act, shall be liable for any damage that may be occasioned thereby upon private property either by overflow or otherwise. The persons owning or operating any such dam shall maintain at their own expense such locks and other structures thereon as shall be adjudged by the Secretary of Commerce and Labor to be necessary. *Damage, etc., for damages.* *Locks, etc., for navigation, etc.*

SEC. 4. That all rights acquired under this Act shall inure to the benefit of the owner, corporation, or individual holding such rights shall at any time fail to comply with any of the provisions and requirements of this Act or with any of the stipulations and conditions that may be prescribed as aforesaid by the Chief of Engineers and the Secretary of War. *Forfeiture of rights.*

SEC. 5. That any persons who shall fail or refuse to comply with the lawful orders of the Secretary of War and the Chief of Engineers made in accordance with the *Failure to comply with orders, etc.*

provisions of this Act, shall be deemed guilty of a violation of this Act, and any persons who shall be guilty of a violation of this Act shall be deemed guilty of a misdemeanor and on conviction thereof shall be punished by a fine not exceeding five thousand dollars, and every month such persons shall remain in default shall be deemed a new offense and subject such persons to additional penalties therefor; and in addition to the penalties above described the Secretary of War and the Chief of Engineers may, upon refusal of the persons owning or controlling any such dam and accessory works to comply with any lawful order issued by the Secretary of War or Chief of Engineers in regard thereto, cause the removal of such dam and accessory works as an obstruction to navigation at the expense of the persons owning or controlling such dam, and suit for such expense may be brought in the name of the United States against such persons, and recovery had for such expense in any court of competent jurisdiction; and the removal of any structures erected or maintained in violation of the provisions of this Act or the order or direction of the Secretary of War or Chief of Engineers made in pursuance thereof may be enforced by injunction, mandamus, or other summary process, upon application to the circuit court in the district in which such structure may, in whole or in part, exist, and proper proceedings to this end may be instituted under the direction of the Attorney-General of the United States at the request of the Chief of Engineers or the Secretary of War; and in case of any litigation arising from any obstruction or alleged obstruction to navigation created by the construction of any dam under this Act, the cause or question arising may be tried before the circuit court of the United States in any district in which any portion of said obstruction or dam touches.

Removal, etc.

Litigation.

Time of construction.

SEC. 6. That whenever Congress shall hereafter by law authorize the construction of any dam across any of the navigable waters of the United States, and no time for the commencement and completion of such dam is named in said Act, the authority thereby granted shall cease and be null and void unless the actual construction of the dam authorized in such Act be commenced within one year and completed within three years from the date of the passage of such Act.

Right to alter, etc., reserved.

SEC. 7. That the right to alter, amend, or repeal this Act is hereby expressly reserved as to any and all dams which may be constructed in accordance with the provisions of this Act, and the United States shall incur no liability for the alteration, amendment, or repeal thereof to the owner or owners or any other persons interested in any dam which shall have been constructed in accordance with its provisions.

Meaning of "persons."

SEC. 8. That the word "persons" as used in this Act shall be construed to import both the singular and the

sional, as the case demands, and shall include corporations, companies, and associations.

Approved, June 21, 1906.

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Apr. 21, 1906.
[H. R. 14, p. 230.]
[H. R. 10[illegible].]
Private. No. 10[illegible].

THE 1866.—AN ACT To authorize the North Mississippi Traction Company to construct dams and power stations on the Bear River in the northeast quarter of section thirty-one, township five, range eleven, in Tippecanoe County, Mississippi.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the North Mississippi Traction Company, their successors and assigns, having authority therefor under the laws of the State of Mississippi, may hereafter erect, maintain, and use a dam or dams in or across the Bear River, in the State of Mississippi, at such points on the northeast quarter of section thirty-one, township five, range eleven, in Tippecanoe County, Mississippi, as they may elect, for the purpose of erecting, operating, and maintaining power stations and to maintain inlet and outlet races or canals and to make such other improvements on Bear River as may be necessary for the development of water power and the transmission of the same, subject always to the provisions and requirements of this Act and to such conditions and stipulations as may be imposed by the Chief of Engineers and the Secretary of War.

Bear River, Miss.
North Mississippi Traction Company may dam.
Location.

SEC. 2. That detailed plans for the construction and operation of a dam or dams and other appurtenances and necessary works shall be submitted by said North Mississippi Traction Company, their successors and assigns, desiring to construct the same, to the Chief of Engineers and the Secretary of War, with a map showing the location of such dam or other structures, with such topographical and hydrographic data as may be necessary for a satisfactory understanding of the same, which must be approved by the Chief of Engineers and the Secretary of War before work can be commenced on said dam or dams or other structures; and after such approval of said plans no deviation whatsoever therefrom shall be made without first obtaining the approval of the Chief of Engineers and the Secretary of War: *Provided*, That the construction hereby authorized do not interfere with the navigation of Bear River: *And provided further*, That said dam or dams and works shall be limited only to the use of the surplus water of the river, not required for the navigation of Bear River, and that no structures shall be built and no operations conducted by those availing themselves of the provisions of this Act which shall injure or interfere with the navigation of Bear River or impair the usefulness of any improvement made by the Government in the interest of navigation.

Secretary of War to approve plans, etc.

Provisos.
Construction not to interfere with navigation.
Restriction.

SEC. 3. That the Government of the United States reserves the right, at any time when the improvement of the

Dams, etc.

(3)

CHAP. 1192.—An Act To authorize J. F. Andrews, J. W. Jourdan, their heirs, representatives, associates, and assigns, to construct dams and power stations on Bear River, on the southeast quarter of section thirty-one, township five, range eleven, in Tishomingo County, Mississippi.

Feb. 25, 1907.
Vol. 34, p. 929.
[H. R. 21194.]
[Public, No. 115.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That J. F. Andrews, J. W. Jourdan, their heirs, representatives, associates, and assigns may hereafter erect, maintain, and use a dam or dams in or across the Bear River, in the State of Mississippi, at such points on the southeast quarter of section thirty-one, township five, range eleven, in Tishomingo County, Mississippi, as they may elect, for the purpose of erecting, operating, and maintaining power stations, and to maintain inlet and outlet races or canals, and to make such other improvements on Bear River as may be necessary for the development of water power and the transmission of the same, in accordance with the provisions of the Act of Congress entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six: *Provided,* That this Act shall in no manner interfere with or impair the rights of any person, company, or corporation heretofore authorized by Congress to erect a dam or other structure for the development of water power on Bear River.

Bear River.
J. F. Andrews et al. may construct dam across, in Tishomingo County Miss.

Vol. 34, p. 386.

Proviso.
Restriction.

SEC. 2. That the right to alter, amend, or repeal this Act is expressly reserved.

Amendment.

Approved, February 25, 1907.

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(4)

CHAP. 91.—An Act To authorize T. H. Friel or assigns to construct a dam across Mulberry Fork of the Black Warrior River.

March 16, 1908.
[H. R. 16746.]
[Public, No. 59.]
Vol. 35, p. 45.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That T. H. Friel or assigns be, and they are hereby, authorized to construct, maintain, and operate a dam across the Mulberry Fork of the Black Warrior River, at a point within ten miles north and within two miles south of its junction with the Sipsey Fork, in Walker County, in the State of Alabama, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Mulberry Fork of Black Warrior River, Ala.
T. H. Friel may dam.
Location.

Vol. 34, p. 386.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 16, 1908.

navigation of Bear River demands it, to construct, maintain, and operate, in connection with any dam or other works built under the provisions of this Act, suitable lock or locks or any other structures for navigation purposes, and at all times to control such dam or dams or other structures, and the level of the pool caused by such dam or dams, to such an extent as may be necessary to provide facilities for navigation; and whenever Congress shall authorize the construction of such lock or other structures, the person, company, or corporation owning and controlling such dam or dams or other structures shall convey to the United States, under such terms as Congress shall prescribe, titles to such land as may be required for the use of such lock and approaches, and in addition thereto shall grant to the United States, free of cost, the free use of water power for building and operating such constructions: *Provided, also,* That the person, company, or corporation building, maintaining, or operating any dam or dams or other structures under the provisions of this Act shall be liable for any damage that may be inflicted thereby upon private property, either by overflow or otherwise, and the nearest State or Federal court shall have jurisdiction to hear suits to determine the amount of compensation for alleged damage. The person, company, or corporation owning or operating any such dam shall maintain, at their own expense, such lights and other signals thereon and such fishways as the Secretary of Commerce and Labor shall prescribe.

Proviso.

Damages.

Lights, etc.

Fishways.

Forfeiture.

SEC. 4. That all the rights acquired under this Act shall cease and be determined if the person, company, or corporation acquiring such right shall at any time fail to comply with any of the provisions or requirements of this Act, or with any of the stipulations that may be prescribed by the Chief of Engineers and the Secretary of War, or in case a person, company, or corporation authorized by the laws of the State of Mississippi to erect and maintain a dam and improvements as contemplated by this Act shall fail to begin the erection of said dam and improvements within one year after being so authorized and shall fail to complete the same within three years after obtaining such authority.

Time of construction.

Prior rights not affected.

SEC. 5. That the provisions of this Act shall in no manner interfere with or impair the rights of any person, company, or corporation heretofore authorized by Congress to erect a dam or other structures for the development of water power on the Tennessee River.

Amendment.

SEC. 6. That the right to alter, amend, or repeal this Act is expressly reserved.

Approved, April 23, 1906.

(7)

CHAP. 77.—An Act To authorize A. J. Smith and his associates to erect a dam across the Choctawhatchee River in Dale County, Alabama.

March 10, 1908.
[H. R. 6195.]
[Public, No. 47.]
Vol. 35, p. 40.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Andrew J. Smith and his associates, their successors and assigns, be, and they are hereby, authorized to construct, maintain, and operate a dam across the Choctawhatchee River about one-eighth of a mile below or west of the bridge across said river on the road known as the Newton and Ozark public road, in Dale County, in the State of Alabama, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Choctawhatchee River.
Andrew J. Smith et al. may dam.
Location.
Vol. 34, p. 386.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 10, 1908.

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(8)

CHAP. 2438.—An Act To authorize the construction of dams and power stations on the Coosa River at Lock Two, Alabama.

May 9, 1906.
Vol. 34, p. 183.
[H. R. 15334.]
[Public, No. 150.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any riparian owner, whether person, company, or corporation having authority therefor under the laws of the State of Alabama may hereafter erect, maintain, and use a dam or dams in or across the Coosa River, in the State of Alabama, at such points at or near Lock Two as they may elect and the Secretary of War may approve, between a point on the eastern side of the river in the abandoned portion thereof at a point below the United States Government dam at Lock Two and above the navigable portion of the river between Locks Two and Three, for the purpose of erecting, operating, and maintaining power stations and to maintain inlet and outlet races or canals and to make such other improvements on the eastern bank of the Coosa River between the two points above mentioned as may be necessary for the development of water power and the transmission of the same, subject always to the provisions and requirements of this Act and to such conditions and stipulations as may be imposed by the Chief of Engineers and the Secretary of War for the protection of navigation and the property and other interests of the United States.

Coosa River, Ala.
Right to dam, etc., near Lock 2, granted.
Location.

SEC. 2. That detailed plans for the construction and operation of a dam or dams and other appurtenant and necessary works shall be submitted by the person, com-

Secretary of War to approve plans, etc.

(5)

March 6, 1908. [H. R. 16051.] [Public, No. 38.] Vol. 35, p. 37.

CHAP. 57.—An Act To authorize the Cahaba Power Company, a corporation organized under the laws of the State of Alabama, to construct a dam across the Cahaba River, in said State, at or near Centerville, Alabama.

Cahaba River. Cahaba Power Company may dam, at Centerville, Ala. Vol. 34, p. 386.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Cahaba Power Company, a corporation organized under the laws of Alabama, its successors and assigns, be, and they are hereby, authorized to construct, maintain, and operate a dam across the Cahaba River at Centerville, in the State of Alabama, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Amendment.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, March 6, 1908.

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(6)

Apr. 5, 1906. Vol. 34, p. 102. [H. R. 14808.] [Public, No 84.]

CHAP. 1367.—An Act Authorizing the Choctawhatchee Power Company to erect a dam in Dale County, Alabama.

Choctawhatchee River. Choctawhatchee Power Company may dam, near Newton, Ala.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Choctawhatchee Power Company, its successors and assigns, be, and is hereby, authorized to erect, build, have, and maintain a steel and concrete dam, or dam of other material, on the Choctawhatchee River at a point above the Atlantic Coast Line Railroad bridge near Newton, on said river and in Dale County, Alabama:

Provisos. Secretary of War to approve plans, etc.

Provided, That the plans of said dam shall be submitted to and be approved by the Chief of Engineers and the Secretary of War before construction is commenced; and the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications in the construction of said dam as he may deem advisable in the interests of navigation: *Provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges; and suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained on said dam.

Sluiceway. Fishways.

Time of completion.

SEC. 2. That this Act shall be null and void unless the dam herein authorized is commenced within one year and completed within three years from the date hereof.

Amendment.

SEC. 3. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, April 5, 1906.

[illegible]

[illegible]—An Act To authorize A. J. Smith and his associates to erect a dam across the Choctawhatchee River in Dale County, Alabama.

March [illegible], 1908.
H. R. [illegible].
Public, No. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Andrew J. Smith and his associates, their successors and assigns, be and they are hereby authorized to construct, maintain and operate a dam across the Choctawhatchee River about one-eighth of a mile below a point of the bridge across said river on the road known as the Newton and Ozark public road in Dale County, in the State of Alabama, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, eighteen hundred and six.

Choctawhatchee River.
Andrew J. Smith, etc., may dam.
Location.
[illegible] p. [illegible].

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved March [illegible], 1908.

[illegible]

[illegible]—An Act To authorize the construction of dams and power stations in the Coosa River at Lock Two, Alabama.

May [illegible], 1908.
H. R. [illegible].
Public, No. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any riparian owner, whether person, company, or corporation having authority therefor under the laws of the State of Alabama may hereafter erect, maintain, and use a dam or dams in or across the Coosa River, in the State of Alabama, at such points as or near Lock Two as they may elect and the Secretary of War may approve, between a point on the eastern side of the river in the abandoned portion thereof at a point below the United States Government dam at Lock Two and above the navigable portion of the river between Locks Two and Three, for the purpose of erecting, operating, and maintaining power stations and to maintain piers and other piers or canals and to make such other improvements on the eastern bank of the Coosa River between the two points above mentioned as may be necessary for the development of water power and the transmission of the same, subject always to the provisions and requirements of this Act and to such conditions and stipulations as may be imposed by the Chief of Engineers and the Secretary of War for the protection of navigation and the property and other interests of the United States.

Coosa River.
Right to dam, etc., near Lock 2 granted.
Location.

SEC. 2. That detailed plans for the construction and operation of a dam or dams and other appurtenant and necessary works shall be submitted by the person, com-

Secretary of War to approve plans, etc.

pany, or corporation desiring to construct the same to the Chief of Engineers and the Secretary of War, with a map showing the location of such dam or other structures, with such topographical and hydrographic data as may be necessary for a satisfactory understanding of the same, which must be approved by the Chief of Engineers and the Secretary of War before work can be commenced on said dam or dams or other structures; and after such approval of said plans, no deviation whatsoever therefrom shall be made without first obtaining the approval of the Chief of Engineers and the Secretary of War: *Provided*, That the constructions hereby authorized do not interfere with the navigation of the Coosa River: *And provided further*, That said dam or dams and works shall be limited only to the use of the surplus water of the river, not required for the navigation of the Coosa River, and that no structures shall be built and no operations conducted by those availing themselves of the provisions of this Act which shall injure or interfere with the navigation of said river or impair the usefulness of any improvement made by the Government in the interest of navigation.

Provisos. Unobstructed navigation. Restricted use of water.

Locks, etc.

SEC. 3. That the Government of the United States reserves the right, at any time that the improvement of the navigation of the Coosa River demands it, to construct, maintain, and operate, in connection with any dam or other works built under the provisions of this Act, suitable lock or locks or any other structures for navigation purposes, and at all times to control such dam or dams or other structures, and the level of the pool caused by such dam or dams, to such an extent as may be necessary to provide facilities for navigation; and whenever Congress shall authorize the construction of such lock or other structures, the person, company, or corporation owning and controlling such dam or dams or other structures shall convey to the United States, under such terms as Congress shall prescribe, titles to such land as may be required for the use of such lock and approaches, and in addition thereto shall grant to the United States, free of cost, the free use of water power for building and operating such constructions: *Provided also*, That the person, company, or corporation building, maintaining, or operating any dam or dams or other structures under the provisions of this Act shall be liable for any damage that may be inflicted thereby upon private property, either by overflow or otherwise, in a court of competent jurisdiction: *Provided further*, That any injury or damage to the navigable capacity of the Coosa River, or to the works of improvement of the United States in the said river which may result from the construction of the dam and other works herein authorized, or any alteration, enlargement, or change in said works of improvement which may, in the judgment of the Secretary of War, be made necessary by the construction of said dam and other works, shall be made good and completed at once by those availing

Conveyance of titles.

Damages.

Injury to navigation.

themselves of the provisions of this Act, their executors, successors, and assigns, and failing this, such injury or damage may be remedied, and such alteration, enlargement, or change may be completed by the United States, and the cost of the work so required shall be paid by the grantees, their heirs or assigns, and to secure the payment for any work done by the United States a bond with good and sufficient security in a sum judged adequate by the Secretary of War for the payment of the costs of such work shall be executed and filed with the Secretary of War before any arrangement shall be taken of the provisions of this Act. The person, company, or corporation owning or operating any such dam shall maintain at their own expense such lights and other signals thereon and such fairways as the Secretary of Commerce and Labor shall prescribe.

Failure to repair damages.

Payment for repairs, etc. Bond.

Lights, etc.

SEC. 4. That if the rights acquired under this Act shall cease or fail by reason of the person, company, or corporation exercising such rights shall at any time fail to comply with any of the provisions or requirements of this Act or with any of the stipulations that may be prescribed by the Chief of Engineers and the Secretary of War, or that a person, company, or corporation authorized by the laws of the State of Alabama to erect and maintain a dam and improvements as contemplated by this Act shall fail to begin the erection of said dam and improvements within two years after being so authorized and shall fail to complete the same within five years after obtaining such authority.

Rights ceased by failure to comply with requirements, etc.

Time of commencement.

SEC. 5. That the provisions of this Act shall in no manner interfere with or impair the rights of any person, company, or corporation heretofore authorized by Congress to erect a dam or other structures for the development of water power on the Coosa River.

Prior rights not affected.

SEC. 6. That the right to alter, amend, or repeal this Act is expressly reserved.

Amendment.

Approved, May 9, 1906.

CH. 2[illegible]—AN ACT Authorizing the use of the waters in Coosa River at Lock Numbered Four, in Alabama.

June 6, 1906.
[H. R. 19[illegible].]
[Public, No. 2[illegible].]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War is hereby authorized and empowered to enter into contract with any individual or corporation, private or municipal, preference being given to riparian owners and their assigns hereinafter designated as the contracting party, to complete the dam and forebay of the lock which has been partially constructed by the Government at Lock Numbered Four on the Coosa River, the work to be done under his supervision and control, and in accordance with the present adopted project and any

Coosa River, Ala.
Completion of Lock No. 4 by private parties authorized.

Provisos. Conditions.

modification thereof that he may deem proper: *Provided*, That the contracting party shall furnish all materials, of every character, and pay for all labor required in the construction of said dam and forebay, which, upon completion, shall become the property of the United States, free of all costs, claims, or charges of any kind whatsoever: *Provided, further*, That the terms of this Act and any stipulations which the Secretary of War may deem necessary to safeguard the interests of navigation and other interests of the United States shall be embodied in any contract entered into as aforesaid.

Protection to navigation.

Time of completion.

SEC. 2. That the contracting party shall begin the said work within two years from the passage of this Act and shall complete the same within four years from the date of commencing construction, and the Secretary of War may, upon reasonable diligence of the contracting party being shown, extend the time for completion, the Government reserving the right to commence and finish the work, if deemed advisable, at any time before it is commenced by the contracting party; or, if begun and not carried out in strict conformity to the directions of the Secretary of War, the Government may assume the completion of said work at its option, the cost of such completion to be paid by the contracting party: *Provided*, That the Secretary of War shall determine from time to time whether the work is being properly done.

Failure to complete.

Proviso. Secretary of War to approve the work.

Contractors granted use of water power.

SEC. 3. That in consideration of the completion of said dam and forebay, including buttresses and gates, free of cost to the Government, the contracting party is hereby granted such rights as the Government possesses to use the water power produced by said dam for manufacturing and other industrial purposes for a period of ninety-nine years: *Provided*, That the plans for the necessary works and structures to utilize said water power shall be approved by the Secretary of War: *Provided further*, That the right is reserved to the United States to construct, maintain, and operate a lock for navigation purposes in connection with said dam and forebay, and nothing shall be done in the use of the water from said dam or otherwise to interfere with or in any way impede or retard the operation of said lock or the proper and complete navigation of the river at all times, nor in any way to interfere with the use and control of the same by the United States or the maintainance [*sic*] of the water surface above the dam at the established pool level; and the Secretary of War is hereby authorized to prescribe regulations to govern the use of the said water power and the operations of the plant and force employed in connection therewith; and no claim shall be made against the United States for any failure of water power, resulting from any cause whatsoever: *Provided further*, That the contracting party shall furnish to the United States, free of cost, such electric current as may be necessary for operating the Government lock, in case the same shall be built, and

Provisos. Plans.

Lock.

Regulations.

Free use of electric current by the United States.

lighting its buildings and grounds: *And provided further*. That the contracting party may have ingress and egress over Government lands in the construction and operation of plant.

Right of ingress and egress.

SEC. 4. That the Secretary of War may require the contracting party to execute a bond, with proper securities, before the commencement of the work, in such amount as he may consider necessary, to insure the beginning, prosecution, and completion of the work and compliance with the terms and requirements of this Act, and in case of failure to comply with the requirements of said bond the contracting party shall forfeit to the United States the full amount thereof: *Provided*. That a suitable force of inspectors shall be employed on the work by the Secretary of War, at the expense of the United States, to see that the plans and specifications and the terms and requirements of the Act and the conditions of the contract are strictly carried out, and any expense incurred by the United States in maintaining said inspectors shall be paid from any funds available pertaining to the appropriations made by Congress for examinations, surveys, and contingencies of rivers and harbors.

Bond.

Forfeiture.

Proviso. Inspection.

Expense.

SEC. 5. That Congress reserves the right to revoke the rights and privileges conferred by this Act: but in the event of such revocation the United States shall pay to the contracting party, as full compensation, the reasonable value, exclusive of any franchise that may be required under this Act, of all properties erected and lands purchased by them, necessary for the enjoyment of the benefits hereby conferred, such value to be determined by mutual agreement between the Secretary of War and the owners of said properties, and in case they can not agree, then by proceedings in condemnation, to be instituted in the proper United States court: *Provided*. That to insure compliance with the terms of the contract, or to protect the interests of navigation and other interests of the United States, the Secretary of War shall have power, at any time before or after the completion of the work, to order a suspension of all privileges granted by this Act, and compliance with such order may be enforced by injunction of the court of the United States exercising jurisdiction in the district in which the work is situated, and proper proceedings to this end shall be instituted by the Attorney-General upon request of the Secretary of War.

Revocation of rights reserved. Reimbursement for improvements, etc.

Proviso. Suspension of privileges.

SEC. 6. That nothing in this Act shall be construed as in any way abridging the exclusive jurisdiction and control by the United States over the Coosa River, and of any structures therein, nor as repealing or modifying any of the provisions of law now existing for the protection of navigation.

Jurisdiction.

Existing law not affected.

Approved, June 4, 1906.

(10)

Mar. 4, 1907.
Vol. 34, p. 1288.

[S. 8526.]
[Public, No. 247.]

CHAP. 2912.—An Act Permitting the erection of a dam across Coosa River, Alabama, at the place selected for Lock Numbered Twelve on said river.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Alabama Power Company, a corporation organized under the laws of the State of Alabama, its successors and assigns, to build a dam, of such height as the Chief of Engineers and the Secretary of War may approve, across the Coosa River, in Alabama, at the place selected for the location of Lock and Dam Numbered Twelve on said river, as located in the survey made by the engineers of the United States of the Coosa and Alabama rivers in Georgia and Alabama, in compliance with the requirements of the river and harbor Act approved June thirteenth, nineteen hundred and two, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power thereby developed: *Provided,* That plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *Provided further,* That the Alabama Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modification of said plans shall have previously been submitted to and received the approval of the Chief of Engineers and Secretary of War: *Provided further,* That said dam and appurtenant works shall be limited to the use of the surplus water only of the river not required for the navigation of the Coosa River, and that no structure shall be built and no operations conducted under the provisions of this Act which shall at any time injure or interfere with the navigation of said river or impair the usefulness of any improvement by the Government in the interests of navigation.

Coosa River, Ala.

Alabama Power Company may dam.

Location.

Vol. 32, p. 353.

Provisos.

Secretary of War to approve plans, etc.

Changes.

Unobstructed navigation.

SEC. 2. That the said dam shall be so constructed, including a proper forebay, that the Government of the United States may at any time construct in connection therewith a suitable lock or locks for navigation purposes, and may at any time, without compensation, control the said dam or other structures and the level of the pool caused by such dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as may be necessary in the interest of

Locks.

Changes.

navigation: *Provided*, That the Alabama Power Company, its successors or assigns, shall furnish the necessary electric current, while its power plant is in operation, to move the gates and operate the locks in connection with said dam and to light the United States buildings and grounds free of cost to the United States: *Provided further*, That the Alabama Power Company, its successors or assigns, is hereby granted the right to use any lands which may belong to the United States of America and necessary for the construction and maintenance of said dam and appurtenant works, or which may be inundated with water by reason of the construction of said dam and appurtenant works, and in consideration therefor the said company, its successors or assigns, shall, upon request of the Chief of Engineers and the Secretary of War, convey free of cost to the United States of America such suitable tract or tracts of land as may be selected by the Chief of Engineers and the Secretary of War for the establishment of such lock or locks and approaches and other purposes as the needs of navigation may require.

Proviso. Electric power.

Use of lands for construction, etc.

Conveyance of other lands to the United States.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within three years and completed within seven years from the time of the passage of this Act.

Time of construction.

SEC. 4. The authority herein conferred shall, except as herein specifically provided, be subject in all respects to the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

SEC. 5. The right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 4, 1907, 10 a. m.

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(11)

CHAP. 3329.—An Act Permitting the building of a dam across the Crow Wing River between the counties of Morrison and Cass, State of Minnesota.

June 14, 1906. Vol. 34, p. 298.

[H. R. 17961.] [Public, No. 256.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Judd Wright, his heirs or assigns, to construct and maintain across the Crow Wing River a dam, canal, and works necessary incident thereto, for water power and supply purposes, at any point at or near the junction of the Gull River with the Crow Wing River, on section thirty, township one hundred and thirty-three north, range twenty-nine west, fifth meridian, between the counties of Morrison and Cass, in the State of Minnesota: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the

Crow Wing River, Minn.

Judd Wright may dam.

Location.

Proviso. Secretary of War to approve plans, etc.

Restriction. commencement of construction of the same: *And provided further*, That the said Judd Wright, his heirs or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modification of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War:

Sluiceway. *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hindrance, and without toll or charges: *And*

Lock. *provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam, so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation; and that the Secretary of War may at any time require and enforce, at the expense of

Changes. the owners, such modifications and changes in the construction of said dam as he may deem advisable in the interests of navigation.

Fishways. SEC. 2. That suitable fishways, to be approved by the Secretary of Commerce and Labor, shall be constructed and maintained at said dam by the said Judd Wright, his heirs or assigns.

Litigation. SEC. 3. That in case any litigation arises from the building of said dam or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota or in the courts of the United States:

Proviso. Existing laws not affected. *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of the same.

Amendment. Time of completion. SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserved, and the same shall become null and void unless the construction of the dam hereby authorized is commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, June 16, 1906.

(12)

[Extract from river and harbor act approved March 3, 1905. Stats. L., vol. 33, p. 1132.]

Cumberland River Improvement Company. Improving the upper Cumberland and South Fork rivers, above Burnside, Kentucky: The Cumberland River

[illegible] May construct dams and locks above Burlington.

[illegible] Secretary of War [illegible] Use of power.

[illegible] Improvement navigation.

[illegible] Size of locks, etc.

[illegible] Open to navigation.

[illegible] Tolls.

[illegible] Power. Time of construction, etc.

[illegible] Bond.

[illegible] Collection of tolls. Time limit. [illegible] Maintenance, etc.

[illegible] Amendment.

(13)

[Extract from river and harbor act approved June 13, 1902. Stats. L., Vol. 32, p. 358.]

Lock and Dam No. 1. Vol. 32, p. 408.

Improving Cumberland River, Tennessee, above Nashville: For the completion of Lock and Dam Numbered One and for maintenance, one hundred and five thousand dollars [a]. And the Secretary of War is hereby authorized, in his discretion, to grant leases or licenses to the highest responsible bidder for the use of the water power created by said dam, at such a rate and on such conditions and for such periods of time as may seem to him expedient; and he is also authorized, in his discretion, to issue permits for the construction, maintenance, and operation of inlet and outlet canals and other structures, on such plans as he may approve, for the diversion of water aforesaid: *Provided*, That any lease or license so granted shall be limited to the use of the surplus water not required for navigation, and no structures shall be built and no operations be conducted which shall in any manner injure navigation, interfere with the operations of the Government, or impair the usefulness of any improvement made by the Government for the benefit of navigation; and the right of Congress to alter, amend, or repeal the provisions of this paragraph is hereby expressly reserved: *Provided further*, That before leasing or licensing such water privileges, or issuing permits for the construction and operation of such canals, or otherwise disposing of any water power or privilege, the Secretary of War shall first advertise the same in one or more daily papers at Nashville, for sixty days immediately preceding, stating specifically the right or privilege proposed to be leased or conveyed, with its exact limitations, inviting bids for the same, and he may, in his discretion, then lease the same for a specific term of years at so much per year, to be paid semi-annually in cash into the Treasury, and the Secretary of War shall reserve the right to reject any or all bids.

Lease of water power.

Canals.

Provisos. Restrictions.

Right to amend, etc., reserved.

Advertising.

Bids.

June 28, 1902. Vol. 32, p. 408.

CHAP. 1299.—An Act To amend an Act entitled "An Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," approved June thirteenth, nineteen hundred and two.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act entitled "An Act making appropriations for the construction, repair, and preservation of certain public works on rivers and harbors, and for other purposes," approved June thirteenth, nineteen hundred and two, be, and the same is hereby, amended so that the two paragraphs thereof providing for the improvement of the Cumberland River, Tennessee, below Nashville, and of the

Cumberland River, Tenn. Improvement of. Vol. 32, p. 358.

[a] This appropriation is increased to $200,000 and the paragraph otherwise amended by act approved June 28, 1902. (See following act.)

damaged by reason of the erection of the said dam: *And provided further*, That nothing herein shall impair any navigation or other rights of any riparian owner, other than the closing of said creek, by the construction, erection, and maintenance of said dam at said location.

Riparian rights protected.

SEC. 2. That the right to alter, amend, and repeal this Act, and the right to require the alteration or removal of the structure authorized without any liability on the part of the United States, are hereby expressly reserved.

Amendment. Right to alter, etc., the dam reserved.

Approved, June 14, 1906.

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(17)

CHAP. 15.—An Act To authorize the construction and maintenance of a dam or dams across the Kansas River, within Shawnee County, in the State of Kansas.

Jan. 22, 1894. Vol. 28, p. 27.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Chicago-Topeka Light, Heat, and Power Company, a corporation organized under the laws of the State of Illinois, its successors and assigns, be, and they are hereby, authorized and empowered to construct and maintain a dam or dams across the Kansas River, at any suitable place or places within the county of Shawnee, in the State of Kansas: *Provided*, That on notice by the Secretary of War that said dam or dams are material obstructions to navigation, said dam or dams shall be at once removed, or suitable lock or locks provided by the owner or owners thereof at his or their expense, so as not to interfere with navigation: *And provided further*, That if after due and sufficient notice in such case the owner or owners of said dam or dams shall neglect or fail to provide suitable lock or locks, or otherwise modify or remove said obstructions, in such manner as the Secretary of War may direct, the said Secretary is hereby authorized and directed to cause suitable lock or locks to be provided, or said obstructions to be removed or modified at the expense of the United States, and to institute proceedings against the person or persons or corporation owning or controlling said dam or dams for the recovery of the expense thereof before the circuit court of the United States in and for the district in which said dam or dams may be located.

Kansas River. Dam across, authorized in Shawnee County.

Provisos. Removal, etc.

Removal, etc., by Secretary of War.

Recovery of expense.

SEC. 2. That the dam or dams herein provided for shall be commenced within one year from the date of approval of this act and completed within three years, under penalty of the forfeiture of the franchise herein granted.

Commencement and completion.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment, etc.

Approved, January 22, 1894.

struct and maintain a dam across the Flint River at a point in Dougherty County, Georgia, about one-fourth mile above the Georgia Northern Railway bridge across said river, upon or in the vicinity of Porter Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 5, 1907.

(15)

Feb. 1, 1905. Vol. 33, p. 628.

CHAP. 288.—An Act Providing for the transfer of forest reserves from the Department of the Interior to the Department of Agriculture.

[H. R. 8460.] [Public, No. 34.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, * * *

* * * * *

Water rights granted for mining, etc., purposes.

SEC. 4. That rights of way for the construction and maintenance of dams, reservoirs, water plants, ditches, flumes, pipes, tunnels, and canals, within and across the forest reserves of the United States, are hereby granted to citizens and corporations of the United States for municipal or mining purposes, and for the purposes of the milling and reduction of ores, during the period of their beneficial use, under such rules and regulations as may be prescribed by the Secretary of the Interior, and subject to the laws of the State or Territory in which said reserves are respectively situated.

Regulations.

* * * * *

Approved, February 1, 1905.

(16)

June 14, 1906. Vol. 34, p. 265.

CHAP. 3301.—An Act To authorize the Charleston Light and Water Company to construct and maintain a dam across Goose Creek in Berkeley County, in the State of South Carolina.

[H. R. 8410.] [Public, No. 230.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the right, power, and privilege to construct, erect, and maintain a dam across the said Goose Creek is hereby authorized, granted, and given to the said the Charleston Light and Water Company, its successors and assigns: *Provided,* That the said the Charleston Light and Water Company shall be liable for all such damages as may be established in any court of competent jurisdiction by any landowner claiming that his land has been

Goose Creek, S. C.

Charleston Light and Water Company may dam.

Provisos.

Damages.

as the Secretary of the Interior may prescribe thereunder. And when such exchange is effected patents for the lands so selected and approved shall issue therefor.

* * * * *

Approved, June 21, 1906.

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(20)

CHAP. 3939.—An Act To authorize Henry T. Henderson and his associates to divert the waters of Little River in the State of Alabama from the lands of the United States for use of electric light and power plant.

June 30, 1906. Vol. 34, p. 818.

[H. R. 20173.] [Public, No. 408.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there be, and is hereby, granted unto Henry T. Henderson and associates the right or authority to perpetually divert the waters of Little River from lands owned by the United States of America, and situated in Mays Gulf, in township eight south, range nine east, in the State of Alabama, for the purpose of storing and utilizing said waters in the operation of a water-power plant to be erected at or near Blanche, in Cherokee County, in the State of Alabama, for the generation of electric energy or power, and the sale of electric light and electric power: *Provided*, That the said Henry T. Henderson and associates shall pay to the Secretary of the Interior the reasonable value thereof within six months after the passage of this Act, the value to be fixed by the register and receiver of the land office in the district where said water is located, and on failure to pay for the same the Secretary of the Interior may, in his discretion, declare forfeited the right to divert said water.

Little River, Ala. Henry T. Henderson may divert, for power plant at Blanche.

Proviso. Payment.

Approved, June 30, 1906.

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(21)

CHAP. 1474.—An Act Permitting the building of a dam across the Mississippi River near the village of Bemidji, Beltrami County, Minnesota.

Mar. 3, 1905. Vol. 33, p. 1043.

[H. R. 19026.] [Public, No. 207.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Kirby Thomas, E. J. Swedback, and M. A. Spooner, their heirs, administrators, and assignees, to build a dam across the Mississippi River near the village of Bemidji, between the outlet of Lake Bemidji and Wolf Lake, Beltrami County, in said river, and near the village of Bemidji, Beltrami County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilizati

Mississippi River. Dam across, near Bemidji, Minn., authorized.

(18)

June 6, 1892.
Vol. 27, p. 46.

CHAP. 92.—An Act Granting to the Topeka Water and Electric Power Company of Kansas the right to erect and maintain a dam or dams across the Kansas River, within Shawnee County, in the State of Kansas.

Topeka Water and Electric Power Co. may dam Kansas River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent of Congress is hereby given to the Topeka Water and Electric Power Company, a corporation created and organized under the laws of Kansas, its successors and assigns, to erect, construct, and maintain a dam or dams across the Kansas River at any suitable place or places within Shawnee County, in the State of Kansas.

Amendment, etc.

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, June 6, 1892.

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(19)

June 21, 1906.
Vol. 34, pp. 325, 368.

[H. R. 15331.]
[Public, No. 258.]

CHAP. 3504.—An Act Making appropriations for the current and contingent expenses of the Indian Department, for fulfilling treaty stipulations with various Indian tribes, and for other purposes, for the fiscal year ending June thirtieth, nineteen hundred and seven.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, * * *

* * * * *

Railroad grant lands in Klamath Reservation.
Exchange authorized.

That the Secretary of the Interior be, and is hereby, authorized, in his discretion, to exchange the whole of the odd numbered sections and parts thereof in the Klamath Indian Reservation in the State of Oregon, now held in private ownership under the final decree and decision of the Supreme Court of the United States, affirming the title of the California and Oregon Land Company thereto, in the suit of the United States against said company as reported in volume one hundred and ninety-two, at page three hundred and fifty-five, of the decisions of said court, and aggregating one hundred and eleven thousand three hundred and eighty-five acres, for other lands not exceeding eighty-seven thousand acres, situate in one or more compact bodies, in townships thirty-one and thirty-two south, of ranges eleven, twelve, and thirteen east in said reservation, said lands so taken in exchange to be selected, subject to the approval of the Secretary of the Interior; and in order to facilitate such exchange and the development of the lands to be so taken thereunder there may also be selected in like manner and as part of the quantity aforesaid other lands in said reservation for the location, construction, and operation of mills and power plants, and with the right to construct railroads, dams, reservoirs, and power-transmission lines, subject to the provisions of existing law and such rules and regulations

Power plants, mills, etc.

as the Secretary of the Interior may prescribe thereunder. And when such exchange is effected patents for the lands so selected and approved shall issue therefor.

* * * * *

Approved June 21, 1906.

[illegible]

June 21, 1906.
Vol. 34, p. 416.

[illegible]
Private. No. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is and is hereby granted unto Henry T. Henderson and associates the right of authority to perpetually divert the waters of Little River from lands owned by the United States of America, and situated in Marshall County, township eight south, range nine east, in the State of Alabama, for the purpose of storing and utilizing such waters in the operation of a water-power plant to be erected at or near Sylacauga, in Chambers County, in the State of Alabama, for the generation of electric energy or power, and the sale of electric light and electric power: *Provided*, That the said Henry T. Henderson and associates shall pay to the Secretary of the Interior the reasonable value thereof within six months after the passage of this Act, the value to be fixed by the register and receiver of the land office in the district where said water is located, and in default to pay for the same the Secretary of the Interior may, in his discretion, declare forfeited the right to divert said water.

Little River, etc.
Henry T. Henderson may divert for power plant at Sylacauga.

Proviso.
Payment.

Approved June 21, 1906.

[illegible]

Mar. 1, 1906.
Vol. 34, p. 1[illegible].

[illegible]
Private. No. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Kirby Thomas, E. J. Swedman, and M. A. Spooner, their heirs, associates, and assignees, to build a dam across the Mississippi River near the village of Bemidji, between the outlet of Lake Bemidji and Wild Lake, Beltrami County, in said river, and near the village of Bemidji, Beltrami County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power

Mississippi River, near Bemidji, Minn., authorized.

Provisos. Secretary of War to approve plans, etc.

thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said Kirby Thomas, E. J. Swedback, and M. A. Spooner, their heirs, administrators, and assignees, shall not deviate from such plans after such approval, either before or after the completion of said structure, unless the modification of said plans shall have previously been admitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such a dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways and lights, to be approved by the Secretary of Commerce and Labor, shall be constructed and maintained at said dam by Kirby Thomas, E. J. Swedback, and M. A. Spooner, their heirs, administrators, and assignees.

Modifications.

Sluiceway.

Lock.

Fishways, etc.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or to exempt said structures from the operation of same.

Proviso. Existing laws not affected.

Time of construction.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, March 3, 1905.

CHAP. 5.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River near the village of Bemidji, in Beltrami County, Minnesota," approved March third, nineteen hundred and five.

February 1, 1906.
[H. R. 7406.]
[Public, No. 5.]
Vol. 34, p. 1.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the time limited in which to complete the dam authorized by the Act entitled "An Act permitting the building of a dam across the Mississippi River near the village of Bemidji, Beltrami County, Minnesota," approved March third, nineteen hundred and five, be, and the same is hereby, extended for a period of one year.

Mississippi River.
Time extended for damming by Kirby Thomas et al. at Bemidji, Minn.
Vol. 33, p. 1044, amended.

Approved, February 1, 1906.

CHAP. 573.—An Act Permitting the building of a dam across the Mississippi River near the city of Bemidji, Beltrami County, Minnesota.

June 4, 1906.
Vol. 34, p. 204.
[H. R. 16836.]
[Public, No. 184.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to William R. Morrison and H. W. Haines to build a dam across the Mississippi River near the city of Bemidji, Minnesota, between the point where the same crosses the west line of township one hundred and forty-five, range thirty-five, and the point where said river crosses the north line of said township in Hubbard County, Minnesota, for the development of water power and such works and structures in connection therewith as may be necessary or convenient in the development of such power and in the utilization of the power thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said William R. Morrison and H. W. Haines, their heirs, administrators, and assigns, shall not deviate from such plans after such approval, either before or after the completion of said structure, unless the modification of said plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway, so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensa-

Mississippi River.
William R. Morrison and H. W. Haines may dam near Bemidji, Minn.

Provisos.
Secretary of War to approve plans, etc.

Changes.

Sluiceway.

Lock.

tion, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation; and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such a dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways and lights, to be approved by the Secretary of Commerce and Labor, shall be constructed and maintained at said dam by William R. Morrison and H. W. Haines, their heirs, administrators, and assigns.

Fishways and lights.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam or from the obstructions of said river by said dam or appurtenant works, cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or to exempt said structures from the operation of the same.

Existing law not affected.

Time of completion.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, June 4, 1906.

(23)

Apr. 15, 1886. Vol. 24, p. 12.

CHAP. 49. An Act To authorize the Mississippi Water-Power and Boom Company, of Brainard [Brainerd], Minnesota, to construct a dam across the Mississippi River.

Dam across Mississippi River may be built by Mississippi Water-Power and Boom Co., of Brainerd, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of the Government is hereby given to the Mississippi Water-Power and Boom Company of Brainard, Minnesota, to construct across the Mississippi River, at some point not more than two miles from the limits of said city of Brainard, to be approved by the Secretary of War, a dam, canal and the appurtenances thereof, for water-power and other purposes, and in connection therewith a wagon and foot bridge for public travel: *Provided*, That the Government of United States may at any time construct in connection therewith a suitable lock for navigation purposes: *Provided also*, That the Government of the United States may at any time take possession of said dam and control the same for purposes of navigation, by paying said company the actual cost of the same, but shall not do so to the destruc-

Canal and bridge.

Provisos.

Lock.

Government may take possession.

[illegible] of the water-power created by said dam: *Provided further*, That the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of said dam as he may deem advisable in the interests of navigation: *Navigation.*
and that said dam shall, if necessary, be so built that boats and rafts may pass through the same without the intervention of any lock or chamber: *And provided further*, That *Irrigation.*
no rights pertaining to any construction of irrigation works for said dam may be used in the United States courts and certain courts for Minnesota.

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved without any claim of any kind against the State of any party in consequence of such amendment or repeal. *Right to alter, amend, or repeal.*

Approved, April 15, 1896.

26

[illegible] — An Act Permitting the building of a dam across the Chippewa River at or near the village of Chippewa Falls, Wright County, Minnesota. *June 24, 1896.*
[illegible] Stat. [illegible]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to The Mississippi River Power Company, a corporation organized under the laws of the State of Minnesota, its successors and assigns, to build a dam across the Mississippi River above the mouth of Chippewa River, at or near the village of Chippewa, Wright County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary and incidental to the development of said power and to the utilization of the power thereby developed: *Provided*, *Mississippi River Power Company in Chippewa Falls, Minn.*
That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That The Mississippi River Power Company, its successors or assigns, shall not detain from such public river such approved amount of water as may be necessary for the operation of such structures, unless the construction of such public dam have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a suitable lock or locks of such dimensions as to permit such boats, rafts, and logs to pass through or over said dam without unnecessary delay or detention and without the payment of tolls: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suit-

Provisos.
Consent of Secretary of War to approval.
Modification of plans.
Navigation.
Dam.

able lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways, to be approved by the Secretary of Commerce and Labor, shall be constructed and maintained at said dam by The Mississippi River Power Company, its successors or assigns.

Control of dam by United States.

Changes.

Fishways.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or to exempt said structures from the operation of same.

Existing laws not affected.

Time of construction.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, June 14, 1906.

Mar. 2, 1907. Vol. 34, p. 1235.

[H. R. 25717.] [Public, No. 205.]

CHAP. 2546.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River at or near the village of Clearwater, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section three of an Act entitled "An Act permitting the building of a dam across the Mississippi River at or near the village of Clearwater, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six, be, and the same hereby is, amended so as to read as follows: "SEC. 3. That this Act shall be null and void unless the construction of the dam hereby authorized is commenced within one year from June fourteenth, nineteen hundred and seven, and completed within three years thereafter."

Mississippi River.

Time extended for dam, at Clearwater, Minn.

Time of construction.

Vol. 34, p. 267, amended.

Approved, March 2, 1907.

25

[Des Moines Rapids.]

CHAP. 16.—AN ACT Granting to the Des Moines Rapids Power Company the right to erect, construct, operate, and maintain a wing dam and power station in the Mississippi River in Hancock County, Illinois.

Jan. 24, 1894.
Vol. 28, p. 32.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Des Moines Rapids Power Company, a corporation created and organized under the laws of the State of Illinois, its successors and assigns, to erect, construct, operate, and maintain a dam along the east bank of the Mississippi River between Nauvoo and Hamilton, in Hancock County, in the State of Illinois, to erect, construct, operate, and maintain a power station thereon, and to erect, construct, operate, and maintain a wing dam five hundred feet from the river from the head of said dam, and to make such other improvements as may be necessary within and along the development of water power and the generation, use, and transmission therefrom of electric energy and power in, on, and upon the Des Moines Rapids of the Mississippi River: *Provided*, That the improvements herein authorized shall not in any way interfere with the existing low-water channel over the Des Moines Rapids, or with any interests of navigation: *And provided further*, That until the plans and locations of the works herein authorized, so far as they affect the interests of navigation, have been approved by the Secretary of War the same shall not be commenced or built.

Des Moines Rapids Power Co. may build dam, etc., Mississippi River.

Proviso.

Navigation not interfered.

Approval of War to approve plans, etc.

SEC. 2. That this act shall be null and void if actual construction of the works herein authorized be not commenced within two years and completed within four years from the date hereof.

Limitation.

SEC. 3. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, February 24, 1894.

26

[Des Moines Rapids.]

CHAP. 161.—AN ACT Granting to Keokuk and Hamilton Water Power Company the right to construct and maintain a wing dam and power station in the Mississippi River in Hancock County, Illinois.

Jan. 4, 1901.
Vol. 31, p. 784.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Keokuk and Hamilton Water Power Company, a corporation created and organized under the laws of the State of Illinois, its successors and assigns, to erect, construct, operate, and maintain a dam along the east bank of the

Keokuk and Hamilton Water Power Co. may dam, etc., Mississippi River in Hancock County, Ill.

Vol. 31, p. 31.

Mississippi River, between Nauvoo and Hamilton, in Hancock County, in the State of Illinois, to erect, construct, operate, and maintain a power station thereon, and to project, erect, construct, operate, and maintain a wing dam five hundred feet into the river from the head of the said canal, and to make such other dams and improvements as may be necessary within said limits for the development of water power and the generation, use, and transmission therefrom of electric energy and power at, in, and upon the Des Moines Rapids of the Mississippi River: *Provided*, That the construction hereby authorized do not in any way interfere with the existing low-water channel over the Des Moines Rapids or with the interests of navigation: *And provided further*, That until the plans and location of the works herein authorized, so far as they affect the interests of navigation, have been approved by the Secretary of War the canal or other improvements shall not be commenced or built.

Provisos. Existing low-water channel, Des Moines Rapids, etc. Approval of plans.

Commencement and completion.

SEC. 2. That this Act shall be null and void if actual construction of the works herein authorized be not commenced within three years and completed within six years from the date hereof.

Amendment.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 8, 1901.

Feb. 26, 1904. Vol. 33, p. 56.

[H. R. 9640.] [Public, No. 32.]

CHAP. 171.—An Act To amend an Act granting to the Keokuk and Hamilton Water Power Company right to construct and maintain a dam, and so forth, approved February eighth, nineteen hundred and one.

Mississippi River. Time extended for dam, etc., by Keokuk and Hamilton Water Power Co. Vol. 31, p. 764, amended.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act granting to the Keokuk and Hamilton Water Power Company right to construct and maintain wing dam, canal, and power station in the Mississippi River in Hancock County, Illinois, approved February eighth, nineteen hundred and one, be, and it is hereby, amended as follows: In section two of said Act strike out the word "three" and insert the word "four" in lieu thereof; also strike out the word "six" and insert the word "seven" in lieu thereof.

Approved, February 26, 1904.

Feb. 9, 1905. Vol. 33, p. 712.

[H. R. 15284.] [Public, No. 65.]

CHAP. 566.—An Act Granting to the Keokuk and Hamilton Water Power Company rights to construct and maintain for the improvement of navigation and development of water power a dam across the Mississippi River.

Mississippi River. Keokuk and Hamilton Water Power Company may dam at Des Moines Rapids, Iowa.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent of Congress is hereby given to the Keokuk and Hamilton Water Power Company, a corporation created and organized under the laws of the State of Illinois, its successors, and assigns, to erect, construct,

operate and maintain a dam with its crest at an elevation of from thirty to thirty-five feet above standard low water across the Mississippi River at or near the foot of the Des Moines Rapids from Keokuk, Iowa, to Hamilton, Illinois, and to construct, operate, and maintain power stations in or in connection with the said dam, with suitable arrangements for the development of water power, and the generation, use, and transmission therefrom of electric energy and power to be derived from the Des Moines Rapids of the Mississippi River: *Provided*, That in lieu of the three locks and the dry dock, with their appurtenances now owned and operated by the United States, at the Des Moines Rapids Canal, the said Keokuk and Hamilton Water Power Company shall build, contiguously with the construction of the said dam and appurtenances, at locations approved by the Secretary of War, a lock and dry dock with their appurtenances: the said lock shall be of such a kind and size and shall have such appurtenances and equipment as shall conveniently and safely accommodate the present and prospective commerce of the Mississippi River; the said dry dock and its appurtenances shall be such as to give equal facilities and conveniences for the repair of vessels at least equal to those afforded by the existing Government dry dock and locks at the Des Moines Rapids Canal: *And provided further*, That the said dam and appurtenant works shall be so designed, located, constructed, maintained and operated, and the said lock and dry dock with their appurtenances shall be so designed, located, constructed and equipped, as to permit at all times during the season of navigation and at any stage of water the safe and uninterrupted navigation of steamboats and other vessels, or of rafts and barges, through the portion of the Mississippi River now occupied by the Des Moines Rapids, as well as through the entire length of the pool formed by the said dam: *And provided further*, That detailed plans for the construction and operation of the said dam, lock, dry dock, and appurtenant works, shall be submitted to and approved by the Secretary of War before the commencement of any portion of the said works, and the said works shall be constructed under the supervision of the engineer officer of the Army designated for that purpose, and that after the approval of the said plans no deviation therefrom shall be made without the prior approval of the Secretary of War of any such deviation: *And provided further*, That compensation shall be made by the said Keokuk and Hamilton Water Power Company to all persons for loss or damage whose land or other property may be taken, injured, or otherwise damaged by the construction, maintenance, and operation of the said works in accordance with the laws of the State where such land or other property may be situated, but the United States shall not be held to have incurred any liability for such damages by the passage of

Purpose of dam and dry dock, etc.

Locations.

Conditions of navigation.

Secretary of War to approve plans, etc.

Supervision of engineer officer, etc.

Compensation for damages.

Nonliability of the United States.

Operation of lock and dry dock.

this Act: *And provided further*, That when the said dam, lock, dry dock, and appurtenant works shall have been completed to the satisfaction of the Secretary of War, the United States shall have the ownership and control of the said lock, dry dock, and their appurtenances, and operate and maintain the same.

Protection to navigation.

SEC. 2. That the withdrawal of water from the Mississippi River and the discharge of water into the said river, for the purpose of operating the said power stations and appurtenant works, shall be under the direction and control of the Secretary of War, and shall at no time be such as to impede or interfere with the safe and convenient navigation of the said river by means of steamboats or other vessels, or by rafts or barges: *Provided*, That the said company shall construct such suitable fishways as may be required from time to time by the Secretary of Commerce and Labor.

Proviso.

Fishways.

Cost of construction, etc.

SEC. 3. That, except as provided for below in this section, the Keokuk and Hamilton Water Power Company shall bear the entire cost of locating, constructing, maintaining, and operating the structures and appurtenances provided for in this Act: *Provided*, That the United States shall bear the cost of the supervision of the work by an engineer officer of the Army as provided for in section one of this Act, and also the cost of maintaining and operating the lock and dry dock with their appurtenances, after their completion and due acceptance by the Secretary of War on behalf of the United States: *And provided further*, That the Keokuk and Hamilton Water Power Company shall provide, in connection with such lock, dry dock, and appurtenances, a suitable power plant for operating and lighting the same, according to plans and specifications submitted to and approved by the Secretary of War.

Provisos.

Cost of supervision.

Power plant.

Repeal of former act.

Vol. 31, p. 764.

SEC. 4. That the Act entitled "An Act granting to the Keokuk and Hamilton Water Power Company right to construct and maintain wing dam, canal, and power station in the Mississippi River in Hancock County, Illinois," approved February eighth, nineteen hundred and one, is hereby repealed.

Time of construction.

SEC. 5. That this Act shall be null and void if actual construction of the works herein authorized be not commenced within five years and completed within ten years from the date hereof.

Amendment.

SEC. 6. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 9, 1905.

[illegible]

[illegible]

[illegible]

Feb. 27, 1900. Vol. 31, p. 33.

CHAP. 26.—An Act To amend an Act entitled "An Act to authorize the Grand Rapids Water Power and Boom Company, of Grand Rapids, Minnesota, to construct a dam and bridge across the Mississippi River," approved February twenty-seventh, eighteen hundred and ninety-nine.

Time extended to Grand Rapids Water Power and Boom Co. to dam, etc., Mississippi River at Grand Rapids, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section three of an Act entitled "An Act to authorize the Grand Rapids Water Power and Boom Company, of Grand Rapids, Minnesota to construct a dam and bridge across the Mississippi River," approved February twenty-seventh, eighteen hundred and ninety-nine, is hereby amended so as to read as follows:

Vol. 30, p. 904.

"SEC. 3. That this Act shall be null and void unless said dam herein authorized be commenced within two years and completed within four years from the date hereof."

Approved, February 27, 1900.

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(28)

July 3, 1886. Vol. 24, p. 123.

CHAP. 623.—An Act To authorize the improvement of the water-power of the Mississippi River at Little Falls, Minnesota.

Little Falls Water-Power Co., may build dam, etc., at Little Falls, Mississippi River, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That it shall be lawful for the Little Falls Water-Power Company of Minnesota to improve and develop the water-power in the Mississippi River at Little Falls, in the State of Minnesota, by constructing, maintaining, and operating in said river, at said Little Falls, dams, piers, sluice ways, canals, locks, ponds, breakwaters, abutments, and mill sites for manufacturing purposes. *Provided,* That there shall be placed and maintained in connection with said dam and other works a sluice-way, lock, or other fixture sufficient and so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam or other works without unreasonable delay or hindrance, and without tolls or charges: *Provided further,* That the Secretary of War may at any time require such changes and alterations to be made in said works, at the expense of said water-power company, as he may deem advisable and necessary in the interest of navigation.

Provisos.

Sluiceway, etc., for passage of logs, etc.

Changes.

SEC. 2. That the right to alter, amend, or repeal this act is hereby expressly reserved.

Approved, July 3, 1886.

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(29)

Mar. 5, 1898. Vol. 30, p. 253.

CHAP. 37.—An Act Permitting the building of a dam between Coon Rapids and the north limits of the city of Minneapolis, Minnesota, across the Mississippi River.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Twin

City Rapid Transit Company, its successors or assigns, to construct across the Mississippi River, at any point between Coon Rapids and the north line of the limits of the city of Minneapolis, a dam, canal, and works necessarily incident thereto, for water-power purposes. The said dam shall be so constructed that there can, at any time, be constructed in connection therewith a suitable lock for navigation purposes: *Provided, also,* That the Government of the United States may at any time take possession of said dam and appurtenant works and control the same for purposes of navigation by paying the said company the value not exceeding the actual cost of the same, but shall not do so to the destruction of the water power created by said dam to any greater extent than may be necessary to provide proper facilities for navigation: *Provided further,* That the works shall be constructed so as to provide for the free passage of saw logs. The said Twin City Rapid Transit Company shall make such change and modification in the works as the Secretary of War may from time to time deem necessary in the interests of navigation, at its own cost and expense: *Provided further,* That in case any litigation arises from the obstruction of the channel by the dam, canal, or appurtenant works, the case may be tried in the proper Federal court of the United States in which the works are situated.

Twin City Rapid Transit Co. may construct dam, etc., across Mississippi River between Coon Rapids and Minneapolis.
Vol. 31, p. 75.
Lock.
Provisos.
Possession by Government, etc.
Passage of saw logs.
Changes.
Litigation to be in Federal court.

SEC. 2. That the right to amend, alter, or repeal this Act is hereby expressly reserved: *And provided further,* That suitable fishways, to be approved by the United States Fish Commisioner, shall be constructed and maintained at said dam by the Twin City Rapid Transit Company, its successors or assigns.

Amendment.
Proviso.
Fishways.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within two years and completed within five years from the date hereof.

Commencement and completion.

Approved, March 5, 1898.

CHAP. 189.—An Act Permitting the building of a dam between Coon Rapids and the north limits of the city of Minneapolis, Minnesota, across the Mississippi River.

Apr. 12, 1900.
Vol. 31, p. 75.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Twin City Rapid Transit Company, its successors or assigns, to construct across the Mississippi River, at any point between Coon Rapids and the north line of the limits of the city of Minneapolis, a dam, canal, and works necessarily incident thereto, for water-power purposes. The said dam shall be so constructed that there can, at any time, be constructed in connection therewith a suitable lock for navigation purposes: *Provided, also,* That the Government of the United States may at any time take possession of said dam and appurtenant works and control the same for purposes of navigation by paying the

Twin City Rapid Transit Co., may dam Mississippi River at Coon Rapids, etc.
Vol. 30, p. 253.
Provisos.
Government control.

said company the value not exceeding the actual cost of the same, but shall not do so to the destruction of the water power created by said dam to any greater extent than may be necessary to provide proper facilities for navigation: *Provided further*, That the works shall be constructed so as to provide for the free passage of saw logs. The said Twin City Rapid Transit Company shall make such change and modification in the works as the Secretary of War may from time to time deem necessary in the interests of navigation, at its own cost and expense: *Provided further*, That in case any litigation arises from the obstruction of the channel by the dam, canal, or appurtenant works, the case may be tried in the proper Federal court of the United States in which the works are situated.

Passage of saw logs.

Changes.

Litigation.

Amendment.

Proviso.

Fishways.

SEC. 2. That the right to amend, alter, or repeal this Act is hereby expressly reserved: *And provided further*, That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by the Twin City Rapid Transit Company, its successors or assigns.

Commencement and completion.

SEC. 3. That this Act shall become null and void unless the dam herein authorized be commenced on or before the first day of July, nineteen hundred and one, and be completed within three years thereafter.

Approved, April 12, 1900.

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(30)

June 25, 1906. Vol. 34, p. 456.

[S. 6451.] [Public, No. 282.]

CHAP. 3530.—An Act To provide for a commission to examine and report concerning the use by the United States of the waters of the Mississippi River flowing over the dams between Saint Paul and Minneapolis, Minnesota.

Mississippi River.

Commission to report on use of surplus water, Minnesota.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That a commission is hereby created to examine and report to the Secretary of War, for transmission to Congress, concerning the use of the surplus water which shall not be needed for the purposes of navigation flowing over the dams now under construction by the United States in the Mississippi River between the cities of Saint Paul and Minneapolis, Minnesota.

Composition.

That such commission shall be composed of one officer of the Corps of Engineers of the United States Army, one officer of the Quartermaster's Department of the United States Army, both of whom shall be designated by the Secretary of War, and one official of the Treasury Department, who shall be an expert in electrical engineering, who shall be designated by the Secretary of the Treasury.

Scope.

SEC. 2. That this commission shall examine and report upon the following propositions:

Use for commercial, etc., power.

First. Whether there will be any surplus water flowing over said dams not needed for the purpose of navigation which might be available for mechanical or commercial power.

Second. Whether such power, or any part thereof, could be economically utilized for furnishing the heat and power now needed or which hereafter may be needed in the buildings and property of the United States at Saint Paul, Minneapolis, and Fort Snelling, Minnesota, and, if so, to what extent, and what proportion or amount of the available power could be so utilized by the United States or disposed of in any manner to the advantage of the United States.

For Government buildings, etc., St. Paul, Minneapolis and Fort Snelling.

Third. If it shall appear to said commission feasible and economical for the United States to use or dispose of such power or any part thereof, then said commission shall report a plan or plans, with terms and conditions for such use or disposition, and an estimate of the cost thereof to the United States.

Plans for using power.

SEC. 3. That the said commission shall meet at such time and place as may be directed by the Secretary of War and shall transmit said report within two years after the passage of this act.

Report.

Approved, June 25, 1906.

II.

June 24, 1908.
Vol. 35, p. 564.

AN ACT Permitting the building of a dam across the Mississippi River above the village of Monticello, Wright County, Minnesota.

H. Res. Public, No. 224.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to The Mississippi River Power Company, a corporation organized under the laws of the State of Minnesota, its successors and assigns, to build a dam across the Mississippi River between the township of Monticello, in Wright County, Minnesota, and the township of Becker, in Sherburne County, Minnesota, and above the village of Monticello, in said Wright County, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power thereby developed. *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That The Mississippi River Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modification of said plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable

Mississippi River, Minn.
The Mississippi River Power Company may dam.
Location.
Vol. 34, p. 236.

Provisos.
Approval by Chief of Engineers and Secretary of War of plans, etc.

Modification of plans.

Sluiceway.

Lock.

delay or hindrance, and without toll or charges: *And further provided*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained at said dam by The Mississippi River Power Company, its successors or assigns.

Control of dam by United States.

Changes.

Fishways.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of same.

Proviso. Existing laws not affected.

Time of completion.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, June 14, 1906.

Mar. 2, 1907. Vol. 34, p. 1235. [H. R. 25716.] [Public. No. 204.]

CHAP. 2545.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River above the village of Monticello, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section three of an Act entitled "An Act permitting the building of a dam across the Mississippi River above the village of Monticello, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six, be, and the same is hereby, amended so as to read as follows:

Mississippi River.

Time extended for dam, above Monticello, Minn.

"SEC 3. That this Act shall be null and void unless the construction of the dam hereby authorized is commenced within one year from June fourteenth, nineteen hundred and seven, and completed within three years thereafter."

Time of construction.

Vol. 34, p. 265, amended.

Approved, March 2, 1907.

(32)

CHAP. 2574.—An Act Permitting the building of a dam across the Mississippi River in the county of Morrison, State of Minnesota.

June 4, 1906.
Vol. 34, p. 209.

[H. R. 17758.]
[Public, No. 193.]

Mississippi River.

The Pike Rapids Power Company may dam, etc., in Morrison County, Minn.
Vol. 34, p. 1219.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to The Pike Rapids Power Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam, canal, and works necessary incident thereto for water power and supply purposes at any point between section twenty, township one hundred and twenty-eight north, range twenty-nine west, and section seventeen, in township thirty-nine, range thirty-two, in Morrison County, Minnesota: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said The Pike Rapids Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modifications of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hindrance, and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for the purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of said dam as he may deem advisable in the interests of navigation.

Provisos.
Secretary of War to approve plans, etc.

Changes.

Sluiceway.

Lock.

SEC. 2. That suitable fishways, to be approved by the Secretary of Commerce and Labor, shall be constructed and maintained at said dam by said corporation, its successors or assigns.

Fishways.

SEC. 3. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota, or in the courts of the United States: *Provided*, That nothing in this Act shall be so construed

Litigation.

Existing law not affected.

as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of same.

Amendment. Time of completion.

SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserved; and the same shall become null and void unless the construction of the dam hereby authorized is commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, June 4, 1906.

Mar. 2, 1907. Vol. 34, p. 1219.

[S. 8377.] [Public, No. 179.]

CHAP. 2520.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River in the county of Morrison, State of Minnesota," approved June fourth, nineteen hundred and six.

Mississippi River. Time extended to The Pike Rapids Power Company to dam, in Morrison County Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section one of an Act entitled "An Act permitting the building of a dam across the Mississippi River in the county of Morrison, State of Minnesota," approved June fourth, nineteen hundred and six, be, and the same is hereby, amended so as to read as follows:

Location. Vol. 34, p. 209, amended.

"SECTION 1. That the consent of Congress is hereby granted to the Pike Rapids Power Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam, canal, and works necessary incident thereto for water power and supply purposes at a point between sections twenty, twenty-nine, and thirty-two in township one hundred and twenty-eight north, range twenty-nine west of the fifth principal meridian, and sections seventeen and twenty, in township thirty-nine, range thirty-two west of the fourth principal meridian, in Morrison County, Minnesota:

Provisos. Secretary of War to approve plans, etc.

Provided, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same:

Changes.

And provided further, That the said the Pike Rapids Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modifications of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War:

Sluiceway.

And provided further, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hinderance [*sic*] and without toll or charges:

Lock.

And provided further, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensa-

tion control the said dam so far as shall be necessary for the purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of said dam as he may deem advisable in the interests of navigation."

SEC. 2. That section four of said Act above referred to be, and the same is hereby, amended so as to read as follows:

"SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserserved, and the same shall become null and void unless the construction of the dam hereby authorized is commenced within one year from June first, nineteen hundred and seven, and completed within three years thereafter, and that except so far as may be otherwise provided in this Act, the provision of the Act of Congress entitled 'An Act to regulate the construction of dams over navigable waters,' approved on the twenty-first day of June, nineteen hundred and six, shall be applicable to the construction of the dam provided in this Act."

Time of construction.

Vol. 34, p. 231, amended.

Vol. 34, p. 386.

Approved, March 2, 1907.

22

CHAP. 942.—An Act Permitting the building of a dam across the Mississippi River between the counties of Wright and Sherburne, in the State of Minnesota.

Mar. 2, 1907.
Vol. 34, p. 48.

H. R. 8887.
Public, No. 4.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Minnesota Power and Trolley Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam, canal, and works necessarily incident thereto, for water-power purposes, at any point between section seventeen or eighteen, in township one hundred and twenty-one north, of range twenty-three west, in Wright County, and section six, in township thirty-two north, of range twenty-six west, in Sherburne County, Minnesota: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of construction of the same: *And provided further*, That the said Minnesota Power and Trolley Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modification of said plans shall have previously been submitted to and received the approval

Mississippi River.

Minnesota Power and Trolley Company may dam in Minnesota near Orono.

Location.

Provisos.
Secretary of War to approve plans, etc.

Modification of plans.

of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States; but nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or to exempt said structures from the operation of same.

Sluiceways for logs, etc.

Aids to navigation.

Changes.

Litigation.

Existing laws not modified.

Fishways.

SEC. 2. That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by said corporation, its successors or assigns.

Amendment.

Time of construction.

SEC. 3. That the right to amend, alter, or repeal this Act is hereby expressly reserved; and the same shall become null and void unless the construction of the dam hereby authorized be commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, March 12, 1904.

Mar. 22, 1906. Vol. 34, p. 84.

[H. R. 15649.] [Public, No. 63.]

CHAP. 1128.—An Act Extending the time for the construction of the dam across the Mississippi River authorized by the Act of Congress approved March twelfth, nineteen hundred and four.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That subject to all the other provisions contained in the Act of Congress entitled "An Act permitting the building of a dam across the Mississippi River between the counties of Wright and Sherburne, in the State of Minnesota," approved March twelfth, nineteen hundred and four, the time limitations for the construction and completion of the dam authorized by said Act are hereby extended until December thirty-first, nineteen hundred and eight.

Mississippi River, Minn.

Time extended for constructing dam (near Otsego) by Minnesota Power and Trolley Company.

Vol. 33, p. 67, amended.

Approved, March 22, 1906.

(34)

[Rock Island, Mississippi River, Moline water power.]

Act of April 19, 1864 (Stats. L., vol. 13, p. 50), relates exclusively to the establishment of an arsenal at Rock Island, Ill., and makes no specific mention of water power, and is therefore, not included in this compilation, it being cited here simply because of reference being made to it by subsequent laws concerning water power.

For history of operations by Ordnance Department concerning the development of this water power see "A History of the Rock Island Arsenal," etc., 1877, published by the Ordnance Department, United States Army.

Act of June 27, 1866 (Stats. L., vol. 14, pp. 75 and 76), appropriates $100,000 "to secure water power at the head of Rock Island." [See next to last paragraph of Section 4.]

No. 54. Joint Resolution to enable the Secretary of War to carry out an agreement in relation to water power for the arsenal at Rock Island.

Be it resolved by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and empowered to carry into effect the recommendations of the commissioners appointed under the acts of April nineteen, eighteen hundred and sixty-four, and June twenty-seven, eighteen hundred and sixty-six, relative to the Moline Water Company and the water power at Rock Island, Illinois, as contained in the report of said commissioners, and to make application for that purpose of the money heretofore appropriated for securing water power at the head of Rock Island.

Approved, March 2, 1867. [Stats. L., vol. 14, p. 573.]

No. 8. Joint resolution to appoint a commission to examine into the matter of contracts made by and between the United States and the Moline Water Power Company as to the water power at Moline, Illinois, and to report to Congress as to same.

Whereas the Moline Water Power Company, of Moline in the State of Illinois, complains that certain contracts made with said Company by the United States, through the Secretary of War, acting under the authority of Congress have not been carried out in good faith in developing and maintaining the water power at said town of Moline as required by said contracts, and that by reason of such failure said Company has sustained and is sustaining large damages, therefore,

Resolved, by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and required to appoint a commission to consist of three competent civil engineers, one of whom shall be the Chief of Engineers of the United States Army, whose duty it shall be to examine into the subject-matter of said contracts, made by and between the United States, as afore-

said, and the said Water Power Company, as to said water power, and the development and maintenance of the same, and to report to the Congress of the United States at its next session, what if anything is necessary to be done by the United States to carry out in good faith said contracts, and to relieve said Water Power Company from its alleged grievances. Said report to be submitted through the Secretary of War, to the Congress of the United States at the commencement of its next session; and to be directed to the Speaker of the House of Representatives.

Approved, March 3, 1877. [Stats. L., vol. 19, p. 410.]

[Extract from sundry civil act approved March 3, 1879. Stats. L., vol. 20, p. 387.]

That the Secretary of War is hereby authorized and empowered to lease the water power, at Moline, or such portion as may be agreed upon, to the Moline Water Power Company upon such terms and conditions and for such term of years as may be agreed upon, if the same can be done consistently with the interests of the Government of the United States. Said lease to be made upon the condition that the said Moline Water Power Company shall go on and complete the development of the water power and maintain it at its own cost and expense.

[Extract from joint resolution approved June 20, 1879. Stats. L., vol. 21, p. 51.]

That the following paragraph in said act sundry civil act approved March 3, 1879—see extract above—, namely: "That the Secretary of War is hereby authorized and empowered to lease the water power at Moline, or such portion as may be agreed upon, to the Moline Water Power Company, upon such terms and conditions, and for such term of years, as may be agreed upon, if the same can be done consistently with the interests of the Government of the United States; said lease to be made upon the condition that the said Moline Water Power Company shall go on and complete the development of the water power and maintain it at its own cost and expense," be, and the same is hereby, repealed.

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(35)

[At Rock Island Rapids.]

Apr. 5, 1904.
Vol. 33, p. 158.
[S. 4142.]
[Public, No. 82.]

CHAP. 860.—An Act Granting to the Davenport Water Power Company rights to construct and maintain a canal, power station, and appurtenant works in the Mississippi River, in Scott County, Iowa.

Mississippi River.
Davenport Water Power Co. may construct a canal, etc. in Scott County, Iowa.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the assent of Congress is hereby given to the Davenport Water Power Company, a corporation created and organized under the laws of the State of Iowa, its successors and assigns, to erect, construct, operate, and maintain a canal along the north bank of the Mississippi

River between Leclaire and Davenport, in Scott County, in the State of Iowa, to erect, construct, operate, and maintain a power station thereon, and to project, erect, construct, operate, and maintain such dams and other works as may be necessary within said limits for the development of water power and the generation, use, and transmission therefrom of electric energy and power at, in, and upon the Rock Island Rapids of the Mississippi River: *Provided*, That the said canal and appurtenant works shall be so designed, constructed, and operated as not to interfere in any way with the safe and convenient navigation of steamboats and other vessels or of rafts and barges over the Rock Island Rapids, at any stage of water; and the expense of any reconstruction or extension of or addition to existing works for the improvement of navigation on the said Rock Island Rapids, which may be found necessary, in the opinion of the Secretary of War, on account of the construction, maintenance, or operation of the said canal and appurtenant works, shall be borne by the said company, its successors, or assigns, under conditions to be prescribed by the Secretary of War: *And provided further*, That detailed plans for the construction and operation of the said canal and appurtenant works shall be submitted to and approved by the Secretary of War before the commencement of the construction of any portion of the said works; and that after the approval of the said plans no deviation therefrom shall be made without the prior approval by the Secretary of War of the said deviation: *And provided further*, That the said works and appurtenances shall be so designed, constructed, and operated as not to overflow or otherwise damage the lands and other property of the United States at Rock Island Arsenal, or injure or diminish the water power of the United States at the said arsenal, or the water power of any person, firm, or corporation having hydraulic works already constructed: *And provided further*, That before entering upon the construction of the said works, compensation shall be made to any person, firm, or corporation whose lands or other property may be taken, overflowed, or otherwise damaged by the construction, maintenance, and operation of the said works, in accordance with the laws of the State where such lands or other property may be situate.

Dams.

Provisos. Obstruction of navigation.

Secretary of War to approve plans, etc.

Protection to Rock Island Arsenal, etc.

Payment of damages.

SEC. 2. That the withdrawal of water from the Mississippi River and the discharge of water into the said river, for the purpose of operating the said canal and appurtenant works, shall be under the direction and control of the Secretary of War, and shall at no time be such as to impede or interfere with the safe and convenient navigation of the said river by means of steamboats or other vessels, or by rafts and barges, or to injure or diminish the water power of the United States at Rock Island Arsenal, or the water power of any person, firm, or cor-

Protection to navigation.

Lock.

delay or hindrance, and without toll or charges: *And further provided*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained at said dam by The Mississippi River Power Company, its successors or assigns.

Control of dam by United States.

Changes.

Fishways.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of same.

Proviso. Existing laws not affected.

Time of completion.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, June 14, 1906.

Mar. 2, 1907. Vol. 34, p. 1235.

[H. R. 25716.] [Public. No. 204.]

CHAP. 2545.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River above the village of Monticello, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six.

Mississippi River.

Time extended for dam, above Monticello, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section three of an Act entitled "An Act permitting the building of a dam across the Mississippi River above the village of Monticello, Wright County, Minnesota," approved June fourteenth, nineteen hundred and six, be, and the same is hereby, amended so as to read as follows:

Time of construction.

Vol. 34, p. 265, amended.

"SEC 3. That this Act shall be null and void unless the construction of the dam hereby authorized is commenced within one year from June fourteenth, nineteen hundred and seven, and completed within three years thereafter."

Approved, March 2, 1907.

wagon and foot-bridge for public travel: *Provided*, That said dam shall be so constructed as not to interfere with the existing dam and mill at Sauk Rapids, and so that the Government of the United States can at any time construct in connection therewith a suitable lock for navigation purposes: *Provided also*, That the Government of the United States may at any time take possession of said dam, and control the same for purposes of navigation, by paying said company the actual cost of the same, but shall not do so to the destruction of the water-power created by said dam: *Provided further*, That the works be constructed so as to provide for the free passage of saw-logs and rafts, and, when necessary, to permit the passage of boats; and, further, that such changes or modifications in the works as the Secretary of War may from time to time deem necessary in the interest of navigation shall be made, at the expense of the water-power company: *Provided further*, That in case of any litigation arising from the obstruction of the channel by the dam, canal, or bridge, the cause may be tried in the district court of the United States in which the works are situated.

Proviso. Not to interfere with dam and mill at Sauk Rapids.

Proviso. Rights of Government of United States reserved.

Proviso. Free passage of saw logs, rafts, etc.

Proviso.

SEC. 2. That the right to amend, alter, or repeal this act is hereby expressly reserved.

Approved, July 5, 1884.

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(37)

CHAP. 167.—An Act Permitting the building of a dam across the Mississippi River at or near the village of Sauk Rapids, Benton County, Minnesota.

Feb. 26, 1904. Vol. 33, p. 52.

[S. 2818.] [Public, No. 28.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Sauk Rapids Water Power Company, a corporation organized under the laws of the State of Minnesota, its successors and assigns, to build a dam across the Mississippi River at or near the Sauk Rapids, so called, in said river, and at or near the village of Sauk Rapids, Benton County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said Sauk Rapids Water Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said

Mississippi River. Sauk Rapids Water Power Co. may dam at Sauk Rapids, Minn.

Provisos. Secretary of War to approve plans, etc.

Modification of plans.

as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of same.

Amendment. Time of completion.

SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserved; and the same shall become null and void unless the construction of the dam hereby authorized is commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, June 4, 1906.

Mar. 2, 1907. Vol. 34, p. 1219. [S. 8377.] [Public, No. 179.]

CHAP. 2520.—An Act To amend an Act entitled "An Act permitting the building of a dam across the Mississippi River in the county of Morrison, State of Minnesota," approved June fourth, nineteen hundred and six.

Mississippi River. Time extended to The Pike Rapids Power Company to dam, in Morrison County Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section one of an Act entitled "An Act permitting the building of a dam across the Mississippi River in the county of Morrison, State of Minnesota," approved June fourth, nineteen hundred and six, be, and the same is hereby, amended so as to read as follows:

Location. Vol. 34, p. 209, amended.

"SECTION 1. That the consent of Congress is hereby granted to the Pike Rapids Power Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam, canal, and works necessary incident thereto for water power and supply purposes at a point between sections twenty, twenty-nine, and thirty-two in township one hundred and twenty-eight north, range twenty-nine west of the fifth principal meridian, and sections seventeen and twenty, in township thirty-nine, range thirty-two west of the fourth principal meridian, in Morrison County, Minnesota: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said the Pike Rapids Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modifications of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hinderance [*sic*] and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensa-

Provisos. Secretary of War to approve plans, etc.

Changes.

Sluiceway.

Lock.

four, be, and the same is hereby, amended so as to read as follows:

"SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within three years and six months and be completed within six years from the time of the passage of this Act."

Approved, March 2, 1907.

Time extended for construction.

28

CHAP. 981.—An Act Permitting the building of a dam across the Mississippi River between the village of Sauk Rapids, Benton County, Minnesota, and the city of Saint Cloud, Stearns County, Minnesota.

Feb. 20, 1908.
[H. R. 11]
[Public, No. 18.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Sauk Rapids Manufacturing Company, a corporation organized under the laws of the State of Minnesota, its successors or assigns, to build a dam across the Mississippi River at the Sauk Rapids, so called, in said river, and between the village of Sauk Rapids, in Benton County, Minnesota, and the city of Saint Cloud, or an addition thereof, in Stearns County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization thereof: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the construction of the same: *And provided further*, That the said Sauk Rapids Manufacturing Company, its successors or assigns, shall not deviate materially from said plans after such approval, either before or after the completion of said structures, unless the modification of said plans shall have been submitted previously to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That said dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control said dam so far as shall be necessary for purposes of navigation, but shall not destroy or reduce the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of said dam

Mississippi River.

Sauk Rapids Manufacturing Company may dam, at Sauk Rapids, Minn.

Provisos.

Secretary of War to approve plans, etc.

Modification of plans.

Sluiceway.

Aids to navigation.

Changes.

of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States; but nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers or to exempt said structures from the operation of same.

Sluiceways for logs, etc.

Aids to navigation.

Changes.

Litigation.

Existing laws not modified.

Fishways.

SEC. 2. That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by said corporation, its successors or assigns.

Amendment.

Time of construction.

SEC. 3. That the right to amend, alter, or repeal this Act is hereby expressly reserved; and the same shall become null and void unless the construction of the dam hereby authorized be commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, March 12, 1904.

Mar. 22, 1906.
Vol. 34, p. 84.

[H. R. 15649.]
[Public, No. 63.]

CHAP. 1128.—An Act Extending the time for the construction of the dam across the Mississippi River authorized by the Act of Congress approved March twelfth, nineteen hundred and four.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That subject to all the other provisions contained in the Act of Congress entitled "An Act permitting the building of a dam across the Mississippi River between the counties of Wright and Sherburne, in the State of Minnesota," approved March twelfth, nineteen hundred and four, the time limitations for the construction and completion of the dam authorized by said Act are hereby extended until December thirty-first, nineteen hundred and eight.

Mississippi River, Minn.

Time extended for constructing dam (near Otsego) by Minnesota Power and Trolley Company.

Vol. 33, p. 67, amended.

Approved, March 22, 1906.

after such approval, either before or after the completion of said structure, unless the modification of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and the Secretary of War: *And provided further*. That there shall be placed and maintained in connection with said dam a sluiceway, so arranged so [sic] as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hinderance [sic] and without toll or charges: *And provided further*. That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith any further suitable lock for navigation purposes and may at any time without compensation control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce at the expense of the owners such modifications and changes in the construction of said dam as he may deem advisable in the interest of navigation: *And provided further*. That in consideration of the conveyance to the United States of America by said corporation, or its successors or assigns, of such suitable tract or tracts of land as may be approved or selected by the Chief of Engineers and the Secretary of War for lock or other purposes for such navigation as aforesaid, the right shall become and the same is hereby vested in the said The Saint Cloud Electric Power Company, its successors and assigns, to flow and inundate with water any islands in the Mississippi River situate above said proposed site and situated southerly of the municipal limits of Saint Cloud, Stearns County, Minnesota, which may belong to the United States of America and which have not been subjected to any entry under the homestead laws or other disposition at the time of the passage of this Act, such right of flowage to be enjoyed without any compensation to be paid to the United States of America, save and except the value of said lands so to be conveyed for lock or other purposes.

Sluiceway.

Lock for navigation.

Flowage rights.

SEC. 2. That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by said corporation, its successors or assigns.

Fishways.

SEC. 3. That in case any litigation arises from the building of said dam or locks or from the obstruction of said river by said dam or appurtenant works cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota or in the courts of the United States.

Litigation.

SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserved, and the same shall become null and void unless the construction of the dam

Amendment.

Time of construction.

as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by said company, its successors or assigns.

Fishways.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, such cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection of the navigation of rivers, or to exempt said structures from the operation of the same.

Proviso. Existing laws not affected.

Time of construction.

SEC. 3. That this Act shall be null and void unless the said dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 20, 1905.

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(39)

[At Augusta.]

June 28, 1906. Vol. 34, p. 537.

[H. R. 19431.] [Public, No. 315.]

CHAP. 3566.—An Act Permitting the building of a dam across the Mississippi River between the counties of Stearns and Sherburne, in the State of Minnesota.

Mississippi River.

The St. Cloud Power Company may dam, in Minnesota (at Augusta).

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to The Saint Cloud Electric Power Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam, canal, and works necessarily incident thereto for water power and supply purposes, and a lock for navigation purposes, which lock shall be operated and kept in repair, as may be required by the Secretary of War, by the said company at its own expense, at any point between section seven, township one hundred and twenty-three, range twenty-seven, in the county of Stearns and State of Minnesota, and section twenty-five, township thirty-five, range thirty-one, and sections thirty and thirty-one, in township thirty-five, range thirty west, in Sherburne County, Minnesota: *Provided*, That the plans for the construction of such dam and appurtenant works including a lock shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said The Saint Cloud Electric Power Company, its successors and assigns, shall not deviate from such plans

Location.

Provisos. Approval of plans.

Changes.

after such approval, either before or after the completion of said structure, unless the modification of such plans shall have previously been submitted to and received the approval of the Chief of Engineers and the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway, so arranged so [sic] as to permit logs, timber, and lumber to pass around, through, and over said dam without unreasonable delay or hinderance [sic] and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith any further suitable lock for navigation purposes and may at any time without compensation control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce at the expense of the owners such modifications and changes in the construction of said dam as he may deem advisable in the interest of navigation: *And provided further*, That in consideration of the conveyance to the United States of America by said corporation, or its successors or assigns, of such suitable tract or tracts of land as may be approved or selected by the Chief of Engineers and the Secretary of War for lock or other purposes for such navigation as aforesaid, the right shall become and the same is hereby vested in the said The Saint Cloud Electric Power Company, its successors and assigns, to flow and inundate with water any islands in the Mississippi River situate above said proposed site and situated adjacent of the municipal limits of Saint Cloud, Stearns County, Minnesota, which may belong to the United States of America and which have not been subjected to any entry under the homestead laws or other disposition at the time of the passage of this Act, such right of flowage to be enjoyed without any compensation to be paid to the United States of America, save and except the value of said lands so to be conveyed for lock or other purposes.

Sluiceway.

Lock for navigation.

Flowage rights.

SEC. 2. That suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained at said dam by said corporation, its successors or assigns.

Fishways.

SEC. 3. That in case any litigation arises from the building of said dam or locks or from the obstruction of said river by said dam or appurtenant works cases may be tried in the proper courts as now provided for that purpose in the State of Minnesota or in the courts of the United States.

Litigation.

SEC. 4. That the right to amend, alter, or repeal this Act is hereby expressly reserved, and the same shall become null and void unless the construction of the dam

Amendment.

Time of construction.

hereby authorized is commenced within one year after the passage of this Act and completed within three years thereafter.

Approved, June 28, 1906.

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(40)

[At Watab.]

Apr. 23, 1904. Vol. 33, p. 295.

[H. R. 14413.] [Public, No. 151.]

CHAP. 1487.—An Act Permitting the building of a dam across the Mississippi River between the counties of Stearns and Benton, in the State of Minnesota.

Mississippi River. Watab Rapids Power Co. may dam in Minnesota. Location.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Watab Rapids Power Company, a Minnesota corporation, its successors or assigns, to construct and maintain across the Mississippi River a dam and works necessary incident thereto for water power and supply purposes at any point not less than four hundred feet above the mouth of Watab River, between section twenty-one, in township one hundred and twenty-five north, range twenty-eight west, in Stearns County, and section nine, in township thirty-six north, range thirty-one west, in Benton County, Minnesota, which may be approved by the Chief of Engineers and the Secretary of War: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Enigneers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the aforesaid Watab Rapids Power Company, its successors or assigns, shall not deviate from such plans after such approval, neither before nor after the completion of said structures, unless the modification of said plans has been previously submitted to and received the approval of the Chief of Engineers and the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications and changes in

Provisos. Secretary of War to approve plans, etc.

Changes.

Sluiceways.

Lock.

CHAP. 2936.—An Act To amend an act entitled "An Act to authorize the Ox Bow Power Company of South Dakota to construct a dam across the Missouri River."

Mar. 4, 1907. Vol. 34, p. 1415.

[H. R. 25672.] [Public, No. 271.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section two of chapter eighteen hundred and twenty-one of the laws of eighteen hundred and ninety-four, approved April twenty-eighth, nineteen hundred and four, is hereby amended to read as follows:

Missouri River, Mont. Time extended to Ox Bow Power Company to dam, at Ox Bow Bend.

"SEC. 2. That this Act shall be null and void unless the structures herein authorized shall be commenced within one year and completed within three years from the date of approval thereof."

Time of construction. Vol. 33, p. 571, amended.

Approved, March 4, 1907, 11 a. m.

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(43)

[Extract from river and harbor act of June 3, 1896 (Public, No. 175, p. 34, par. 1) relative to construction of dams across Missouri River above Stubbs Ferry, Mont.]

Improving the upper Missouri River between Stubbs' Ferry, in Montana, and the lower limits of Sioux City, Iowa. * * * *Provided,* That subject to such conditions as the Secretary of War may prescribe, any person, company, or corporation may construct a dam or dams across said river above Stubbs Ferry, with necessary canal and improvements to develop water power and for other useful purposes; * * *

Missouri River. Stubbs Ferry, Mont., to Sioux City, Iowa. *Proviso.* Dams permitted.

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(44)

[Near Stubbs Ferry.]

CHAP. 103.—An Act To authorize the Missouri River Power Company of Montana to construct a dam across the Missouri River.

June 8, 1894. Vol. 28, p. 91.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of the Government is hereby given to the Missouri River Power Company of Montana, its successors or assigns, to construct across the Missouri River, at some point at or near the southeast corner of Township Eleven north, of Range Two west, Montana meridian, to be approved by the Secretary of War, a dam, canal, and the appurtenances thereof, for water power and other purposes, and in connection therewith a footbridge or bridges for public use. Said dam shall be constructed under the supervision and control of the Secretary of War, and before the same shall be commenced the plans and specifications shall be approved by the Secretary of War. The dam shall be furnished with a suitable boom and log sluice, and the company, or its successors and assigns, shall execute to the United States, with

Missouri River Power Co. may dam Missouri River, Mont.

Secretary of War to approve plans, etc.

Sluice, etc.

(42)

[At Ox Bow Bend.]

Apr. 28, 1904.
Vol. 33, p. 570.

[H. R. 11972.]
[Public, No. 253.]

CHAP. 1821.—An Act To authorize the Ox Bow Power Company, of South Dakota, to construct a dam across the Missouri River.

Missouri River, S. Dak.
Ox Bow Power Co. may construct dam across.
Location.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of the Government is hereby given to the Ox Bow Power Company, of South Dakota, its successors or assigns, to construct across the Missouri River, from lot three, in section twenty-six, township fourteen north, range three west of the Montana meridian, to the opposite bank of same river, to be approved by the Secretary of War, a dam, causeway, and the appurtenances thereof for water power and other purposes:

Provisos.
Secretary of War to approve plans, etc.

Provided, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of construction, and when so approved no change shall be made in said plans without the prior approval of the Chief of Engineers and the Secretary of War: *Provided further*, That the said company shall construct and maintain in connection with said dam a suitable boom and log sluice; that suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained in said dam by said corporation, its successors or assigns; and shall obtain and convey to the United States, whenever requested to do so by the Secretary of War, clear title to such land as in his judgment may be required for constructions and approaches to said dam for transferring boats and freight around the same, and shall grant to the United States a free use of water power for operating such construction work; and to insure compliance with these conditions the said company shall execute and deliver to the Secretary of War a proper bond, in such amount as may be fixed by him: *And provided further*, That the said company shall be liable for any damage to private property resulting from the construction and operation of said dam and appurtenant works, either by overflow or otherwise, and proceedings to recover compensation for such damage may be instituted either in the State or Federal courts.

Booms, etc.
Fishways.
Conveyance of title to United States.
Use of water power.
Bond.
Damages.
Proceedings.

Time of construction.

SEC. 2. That this Act shall be null and void unless the structures herein authorized shall be commenced within one year and completed within three years from the date of approval hereof.

Amendment.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, April 28, 1904.

wagon and foot-bridge for public travel: *Provided*, That said dam shall be so constructed as not to interfere with the existing dam and mill at Sauk Rapids, and so that the Government of the United States can at any time construct in connection therewith a suitable lock for navigation purposes: *Provided also*, That the Government of the United States may at any time take possession of said dam, and control the same for purposes of navigation, by paying said company the actual cost of the same, but shall not do so to the destruction of the water-power created by said dam: *Provided further*, That the works be constructed so as to provide for the free passage of saw-logs and rafts, and, when necessary, to permit the passage of boats; and, further, that such changes or modifications in the works as the Secretary of War may from time to time deem necessary in the interest of navigation shall be made, at the expense of the water-power company: *Provided further*, That in case of any litigation arising from the obstruction of the channel by the dam, canal, or bridge, the cause may be tried in the district court of the United States in which the works are situated.

Proviso. Not to interfere with dam and mill at Sauk Rapids.

Proviso. Rights of Government of United States reserved.

Proviso. Free passage of saw logs, rafts, etc.

Proviso.

SEC. 2. That the right to amend, alter, or repeal this act is hereby expressly reserved.

Approved, July 5, 1884.

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(37)

CHAP. 167.—An Act Permitting the building of a dam across the Mississippi River at or near the village of Sauk Rapids, Benton County, Minnesota.

Feb. 26, 1904. Vol. 33, p. 52.

[S. 2818.] [Public, No. 28.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Sauk Rapids Water Power Company, a corporation organized under the laws of the State of Minnesota, its successors and assigns, to build a dam across the Mississippi River at or near the Sauk Rapids, so called, in said river, and at or near the village of Sauk Rapids, Benton County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said Sauk Rapids Water Power Company, its successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said

Mississippi River.

Sauk Rapids Water Power Co. may dam at Sauk Rapids, Minn.

Provisos. Secretary of War to approve plans, etc.

Modification of plans.

sureties approved by the Secretary of War, a bond in such sum as the Secretary may determine, conditioned to indemnify the United States against all claims for damages for overflow or otherwise caused by the construction of said dam.

Government use, etc.

SEC. 2. That the United States shall be secured a free right of way for constructions and approaches to said dam for transferring boats and freight around the same, and a free use of water power for operating such construction works.

Amendment, etc.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved, and the rights and privileges hereby granted to said Missouri River Power Company shall expire at the end of fifty years from and after the approval of this Act.

Approved, June 8, 1894.

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(45)

[Vicinity of Buck Rapids, Mont.]

Apr. 12, 1906.
Vol. 34, p. 111.

[S. 4130.]
[Public, No. 93.]

CHAP. 1617.—An Act To authorize the Capital City Improvement Company, of Helena, Montana, to construct a dam across the Missouri River.

Missouri River, Mont.

Capital City Improvement Company, of Helena, may dam (in vicinity of Buck Rapids).

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of the Government is hereby given to the Capital City Improvement Company, of Helena, Montana, its successors or assigns, to construct across the Missouri River, at some point between the south line of township twelve north, range two west, and the north line of township fourteen north, range three west, Montana meridian, to be determined by them and approved by the Secretary of War, a dam, canal, and appurtenances thereof, for water power, and other purposes, and in connection therewith a foot bridge, or bridges, for public use: *Provided,* That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of construction, and when so approved no change shall be made in said plans without the prior approval of the Chief of Engineers and the Secretary of War: *Provided further,* That whenever required to do so by the Secretary of War the said company shall construct and maintain in connection with said dam a suitable boom and log sluice; that suitable fishways, to be approved by the United States Fish Commissioner, shall be constructed and maintained in said dam by said corporation, its successors and assigns; and shall obtain and convey to the United States, whenever requested to do so by the Secretary of War, clear title to such land as in his judgment may be

Canal, foot-bridges, etc.

Provisos.
Secretary of War to approve plans, etc.

Sluiceway. Boom, etc.

required for constructions and approaches to said dam for transferring boats and freight around the same, and shall grant to the United States a free use of water power for operating such construction works; and to insure compliance with these conditions the said company shall execute and deliver to the Secretary of War a proper bond in such amount as may be fixed by him: *And provided further*, That the said company shall be liable for any damage to private property resulting from the construction and operation of said dam and appurtenant works, either by overflow or otherwise, and proceedings to recover compensation for such damage may be instituted either in the State or Federal courts.

Transfer of freight, etc.

Bond.

Damages.

SEC. 2. That this Act shall be null and void unless the structures herein authorized shall be commenced within one year and completed within three years from the date of approval hereof.

Time of construction.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, April 11, 1906.

90

Chap. 621.—An Act Permitting building a dam across New River.

June 6, 1906.
[H. R. 9[illegible].]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to F. H. Fries and W. C. Ruffin, of the State of North Carolina, their successors and assigns, to erect, construct, and maintain across New River, in Grayson County, Virginia, at any point within two miles of the mouth of Sneeden Creek, a dam and all other works necessarily incident thereto for water-power purposes: *Provided*, That the said F. H. Fries and W. C. Ruffin, their successors and assigns, shall make at their own expense such change and modification of the said dam as the Secretary of War may from time to time direct in the interests of the navigation of said river: *Provided further*, That locks suitable for the passage of fish over the said dam shall be constructed and maintained by the said parties, their successors and assigns, as may from time to time be required by the United States Fish Commissioner: *Provided further*, That in case any litigation arises from the construction of the structure by the said dam, or works appurtenant thereto, that the same may be tried in the courts of the United States having proper jurisdiction.

F. H. Fries et al. may dam New River, Va.

Provisos.

Changes.

Passage of fish.

Litigation.

SEC. 2. That this Act shall become null and void unless the dam herein authorized shall be commenced within two years and completed within five years of the date hereof.

Commencement and completion.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, June 6, 1906.

(47)

June 18, 1906. Vol. 34, p. 297

[H. R. 17982.] [Public No. 239.]

CHAP. 3340.—An Act To grant to Charles H. Cornell, his assigns and successors, the right to abut a dam across the Niobrara River on the Fort Niobrara Military Reservation, Nebraska, and to construct and operate a trolley or electric railway line and telegraph and telephone lines across said reservation.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Charles H. Cornell, his assigns, assignees, successors, and grantees, be, and are hereby, privileged, authorized, and granted the authority and right to construct, maintain, and use for power purposes a dam across the Niobrara River on parts of sections twenty-two and twenty-seven, township thirty-four north, range twenty-seven west of the sixth principal meridian, in the State of Nebraska, and to abut said dam on the east bank of said Niobrara River upon land which is a part of the Fort Niobrara Military Reservation, the property of the United States; and said dam may be of sufficient height and strength to support a body of water affording or furnishing as much as fifty feet effective head for power purposes, with the privilege of backing water upon or overflowing such part of the Fort Niobrara Military Reservation as may reasonably result from the proper construction, maintenance, and use of said dam, and that any damages caused thereby may be assessed by the Secretary of War and paid to the United States before any construction hereby provided for shall be commenced, * * * *Provided*, That the grants and privileges above specified as to such dam, water power * * * aforesaid shall become void unless the construction of said dam be commenced within two years from the approval of this Act and completed and put into operation within five years from the approval of this Act; * * * *Provided*, That a map of said proposed dam, storage reservoir * * * shall be filed with the honorable Secretary of War, and the location thereof shall by him be approved before any of these privileges herein aforesaid shall become effective: *Provided further*, That the privileges herein granted may at any time be rescinded or suspended by order of the Secretary of War; * * *

Niobrara River.

Charles H. Cornell may dam, etc. on Fort Niobrara Military Reservation, Nebr.

Overflow etc.

Damages.

Provisos.

Time for completion.

Secretary of War to approve plans, etc.

Approved, June 18, 1906.

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(48)

Jan. 14, 1901. Vol. 31, p. 729.

CHAP. 11.—An Act Permitting the building of a dam across the Osage River at the city of Warsaw, Benton County, Missouri.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the city of Warsaw, being a city incorporated and organized under the laws of the State of Missouri, its successors or

Warsaw, Mo., may dam Osage River.

to deviate from such plans, either before or after the completion of the structure, unless the modification of such plans has previously been submitted to and received the approval of the Secretary of War.

Sec. 2. That the Government of the United States reserves the right at any time that the improvement of the navigation of the Pend d'Oreille River demands it to construct, maintain, and operate, in connection with any dam or other works built under the provisions of this Act, suitable lock or locks or any other structures for navigation purposes, and at all times to control such dam or dams or other structures, and the level of the pool caused by such dam or dams, to such an extent as may be necessary to provide facilities for navigation; and whenever Congress shall authorize the construction of such lock or other structures, the Pend d'Oreille Development Company, its successors or assigns, owning and controlling such dam or other structures, shall convey to the United States, under such terms as Congress shall prescribe, title to such lands as may be required for such lock and approaches, and in addition thereto shall grant to the United States free of cost the free use of water power for building and operating such constructions: *Provided*, That the Pend d'Oreille Development Company, its successors or assigns, building, maintaining, or operating any dam or other structures under the provisions of this Act, shall be liable for any damage that may be inflicted thereby upon private property, either by overflow or otherwise, in a court of competent jurisdiction. The Pend d'Oreille Development Company, its successors or assigns, owning or operating any such dam, shall maintain at their own expense such locks and other signals thereon and such fishways and such ways for the free passage of saw logs as the Secretary of Commerce and Labor shall prescribe.

Locks, etc.

Protection to navigation.

Conveyance of title to United States.

Free use of water power.

Proviso. Damages.

Logs, etc.

Sec. 3. That this Act shall be null and void unless the dam herein authorized shall be commenced within two years and completed within five years from the date of the approval hereof.

Time of completion.

Sec. 4. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, June 1, 1906.

II.

Feb. 3, 1909.
Vol. 35, p. 611.

CHAP. 130.—AN ACT Authorizing the construction of a dam across the Pend d'Oreille River in the State of Washington, by the Pend d'Oreille Development Company, for the development of water power, electrical power, and for other purposes.

H. R. 30767.
Pend d'Oreille River, Wash.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to, and it shall

nection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges; and suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained on said dam.

Fishways.

Time of construction.

SEC. 2. That this Act shall be null and void unless the dam herein authorized is commenced within one year and completed within three years from the date hereof.

Amendment.

SEC. 3. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 23, 1906.

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(50)

June 1, 1906.
Vol. 34, p. 205.

[S. 6038.]
[Public, No. 187.]

CHAP. 2568.—An Act Authorizing the construction of a dam across the Pend d'Oreille River, in the State of Washington, by the Pend d'Oreille Development Company, for the development of water power, electrical power, and for other purposes.

Pend Oreille River.

Pend d'Oreille Development Company may dam, at Big Falls, Wash.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to, and it shall be lawful for, the Pend d'Oreille Development Company, a corporation duly incorporated under the laws of the State of Washington, its successors or assigns, to construct and maintain a dam across the Pend d'Oreille River at a point at or about the Big Falls (sometimes known as Metaline Falls) on the Pend d'Oreille River, in the county of Stevens, State of Washington, such point to be selected by the Pend d'Oreille Development Company, its successors or assigns, at said falls, or within one thousand feet above or below the same, for the purpose of erecting, operating, and maintaining a power station, and to maintain inlet and outlet races or canals, and to make such other improvements as may be necessary for the devlopment of water power, electrical power, and the transmission of the same, subject always to the provisions and requirements of this Act and to such conditions and stipulations as may be imposed by the Chief of Engineers and the Secretary of War for the protection of navigation and the property and other interests of the United States:

Proviso.
Secretary of War to approve plans, etc.

Provided, That such dam and works shall not be built or commenced until after the plans and specifications for their construction, together with such drawings of the proposed construction and such map of the proposed locations as may be required for a full understanding of the subject have been submitted to the Secretary of War for his approval, and until after he shall have approved such plan and specifications and the location of such dams and accessory works; when the plans for any dam to be constructed under the provisions of this Act have been approved by the Secretary of War it shall not be lawful

Changes.

to deviate from such plans, either before or after the completion of the structure, unless the modification of such plans has previously been submitted to and received the approval of the Secretary of War.

Locks, etc.

SEC. 2. That the Government of the United States reserves the right at any time that the improvement of the navigation of the Pend d'Oreille River demands it to construct, maintain, and operate, in connection with any dam or other works built under the provisions of this Act, suitable lock or locks or any other structures for navigation purposes, and at all times to control such dam or dams or other structures, and the level of the pool caused by such dam or dams, to such an extent as may be necessary to provide facilities for navigation; and whenever Congress shall authorize the construction of such lock or other structures, the Pend d'Oreille Development Company, its successors or assigns, owning and controlling such dam or other structures, shall convey to the United States, under such terms as Congress shall prescribe, title to such lands as may be required for such lock and appurtenances, and in addition thereto shall grant to the United States free of cost the free use of water power for building and operating such constructions: *Provided*, That the Pend d'Oreille Development Company, its successors or assigns, building, maintaining, or operating any dam or other structures under the provisions of this Act, shall be liable for any damage that may be inflicted thereby upon private property, either by overflow or otherwise, in a court of competent jurisdiction. The Pend d'Oreille Development Company, its successors or assigns, owning or operating any such dam, shall maintain at their own expense such lights and other signals thereon and such chutes and such ways for the free passage of saw logs as the Secretary of Commerce and Labor shall prescribe.

Protection to navigation.

Conveyance of title to United States.

Free use of water power.

Proviso. Damages.

Lights, etc.

SEC. 3. That this Act shall be null and void unless the dam herein authorized shall be commenced within two years and completed within five years from the date of the approval hereof.

Time of completion.

SEC. 4. That the right to alter, amend, or repeal this Act is hereby expressly reserserved.

Amendment.

Approved, June 1, 1906.

II

Feb. 25, 1907. Vol. 34, p. 931.

H. R. 16762. Public, No. 214.

CHAP. 1106.—AN ACT Authorizing the construction of a dam across the Pend d'Oreille River, in the State of Washington, by the Pend d'Oreille Development Company, for the development of water power, electric power, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to, and it shall

Pend d'Oreille River, Wash.

Pend d'Oreille Development Company may dam.

be lawful for, the Pend d'Oreille Development Company, a corporation duly incorporated under the laws of the State of Washington, its successors or assigns, to construct and maintain a dam across the Pend d'Oreille River at a point at or about where Pierwee Creek empties into the Pend d'Oreille River, near the international boundary line in the county of Stevens, State of Washington, at such point to be selected by the said Pend d'Oreille Development Company, its successors or assigns, at the mouth of said Pierwee Creek, or within one thousand feet above or below the same, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Location.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 25, 1907.

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(52)

May 4, 1898. Vol. 30, p. 398.

CHAP. 238.—An Act Permitting the building of a dam across Rainy Lake River.

Koochiching Company may dam Rainy River, Minn.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Koochiching Company, its successors and assigns, to construct across the Rainy Lake River, at any part of the rapids in section twenty-seven, township seventy-one north, range twenty-four west of the fourth principal meridian, in the State of Minnesota, a dam, canal, and works necessarily incident thereto, for water-power purposes. The said dam shall be so constructed that there can at any time be constructed in connection therewith a suitable lock for navigation purposes: *Provided*, That the Government of the United States may at any time take possession of said dam and appurtenant works and control the same for purposes of navigation by paying the said company the actual cost of the same, but shall not do so to the destruction of the water power created by said dam to any greater extent than may be necessary to provide proper facilities for navigation: *Provided further*, That the works shall be constructed so as to provide for the free passage of saw logs and fish. The said Koochiching Company, its successors and assigns, shall make such change and modification in the works as the Secretary of War may from time to time deem necessary in the interests of navigation, at its own cost and expense: *Provided further*, That in case any litigation arises from the obstruction of the channel by the dam, canal, or other works erected in connection therewith, the case may be tried in the proper court of the United States in the district in which the works are situated.

Vol. 31, p. 167 Vol. 32, p. 485.

—lock.

Provisos. Government possession.

Passage of saw logs and fish.

Changes.

Litigation.

SEC. 2. That the right to amend, alter, or repeal this Act is hereby expressly reserved. Amendment.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and completed within three years from the date hereof. Commencement and completion. Vol. 31, p. 167.

Approved, May 4, 1898.

CHAP. 591.—AN ACT To amend an Act entitled "An Act permitting the building of a dam across Rainy Lake River." May 4, 1898. Vol. 31, p. 167.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That section three of an Act entitled "An Act permitting the building of a dam across Rainy Lake River," approved May fourth, eighteen hundred and ninety-eight, and granting to the Koochiching Company, its successors and assigns, the consent of Congress to construct a dam across the Rainy Lake River, be, and the same is hereby amended so as to read as follows: Time extended to the Koochiching Co., to dam Rainy River, Minn. Vol. 31, p. 166.

"That this Act shall be null and void unless the dam herein authorized shall be commenced within three years and completed within five years after the fourth day of May, eighteen hundred and ninety-eight." Vol. 32, p. 485.

Approved, May 4, 1903.

CHAP. 1305.—AN ACT Relating to the construction of a dam across Rainy River. June 28, 1902. Vol. 32, p. 485.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the time for the construction of a dam across the Rainy River by the Koochiching Company, its successors and assigns, as provided by chapter two hundred and thirty-eight of volume thirty of the Statutes at Large and chapter three hundred and forty-six of volume thirty-one of the Statutes at Large, is hereby extended to May fourth, nineteen hundred and seven. Rainy River, Minn. Time extended to the Koochiching Company to dam. Vol. 31, p. 166. Vol. 31, p. 167.

SEC. 2. That the Koochiching Company, its successors and assigns, is hereby authorized to construct and maintain said dam, subject to the terms of said chapter two hundred and thirty-eight of volume thirty of the Statutes at Large, upon the plans now on file with the Secretary of War, or any modification of said plans which the Secretary of War may approve; and the Koochiching Company, its successors and assigns, is hereby authorized to construct such dam at such height as will raise the waters of Rainy Lake to high-water mark: *Provided*, That said dam shall be furnished with such openings or gates or waste ways as will carry the waters of the river at flood stage without raising the water higher than it would rise in the natural condition of the stream: *And provided further*, That nothing in this Act contained shall be construed as relieving the Koochiching Company, its successors or assigns, from liability for any Terms. Vol. 31, p. 166. Height of dam. Provisos. Waste ways. Damages.

damage inflicted upon private property by reason of the raising of the waters of the lake as aforesaid.

Effect

SEC. 3. That this Act shall take effect and be in force from and after its passage.

Approved, June 28, 1902.

Feb. 25, 1905. Vol. 33, p. 814.

CHAP. 797.—An Act Relating to a dam across Rainy River.

[H. R. 17331.] [Public, No. 103.]

Rainy River, Minn.

Rainy River Improvement Company to succeed to rights of former company.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Rainy River Improvement Company, a corporation organized under the laws of the State of Minnesota for the improvement of the navigation of Rainy River and Rainy Lake, and its successors and assigns, upon filing with the Secretary of War proof satisfactory to him of its succession to the rights and privileges granted to the Koochiching Company by the following Acts of Congress, namely: Chapter two hundred and thirty-eight of volume thirty of the Statutes at Large, "An Act permitting the building of a dam across Rainy Lake River," approved May fourth, eighteen hundred and ninety-eight; chapter three hundred and forty-six of volume thirty-one of the Statutes at Large, "An Act to amend an Act entitled 'An Act permitting the building of a dam across Rainy Lake River,'" approved May fourth, nineteen hundred; chapter thirteen hundred and five, volume thirty-two, of the Statutes at Large, "An Act relating to the construction of a dam across Rainy River," approved June twenty-eighth, nineteen hundred and two, shall have the right, subject to the restrictions, conditions, and terms of said several Acts, to construct and maintain the dam provided for therein, at such height as the Secretary of War may approve: *Provided*, That such dam shall be completed on or before July first, nineteen hundred and eight.

Vol. 30, p. 398.

Vol. 31, p. 167.

Vol. 32, p. 485.

Proviso. Time of construction.

Proof of succession.

SEC. 2. That upon filing the proof of its succession to the rights of the Koochiching Company, and the approval thereof by the Secretary of War, that officer shall issue to the Rainy River Improvement Company a certificate of such approval.

Amendment.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 25, 1905.

May 23, 1908. [H. R. 15444.]

CHAP. 194.—An Act Extending the time for the construction of a dam across Rainy River.

[Public, No. 138.]

Vol. 35, p. 273.

Rainy River. Time extended for damming, by Rainy River Improvement Company.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Rainy River Improvement Company, a corporation organized under the laws of the State of Minnesota, as the successor to the rights and privileges heretofore granted to the Koochiching Company under the following acts of Congress, namely: Chapter two hundred and thirty-eight of volume thirty, Statutes at Large,

entitled "An Act permitting the building of a dam across Rainy River," approved May fourth, eighteen hundred and ninety-eight; and of chapter seven hundred and ninety-seven of volume thirty-three Statutes at Large, entitled "An Act relating to a dam across Rainy River," approved February twenty-fifth, nineteen hundred and five, and of the various Acts and provisions therein referred amending said Act approved May fourth, eighteen hundred and ninety-eight, and further subject to the restrictions, conditions, and terms of all of said Acts, is hereby authorized to construct and maintain a dam across Rainy River, Minnesota, at the place designated in said Acts, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six, so far as the same shall be applicable thereto: *Provided*, That said dam shall be completed on or before July, nineteen hundred and eleven.

Vol. 33, p. 844.

Vol. 33, p. 814.

Vol. 34, p. 386.

Time of completion.

Sec. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

J. G. Cannon,
Speaker of the House of Representatives.
Chas. W. Fairbanks,
Vice-President of the United States and President of the Senate.

In the House of Representatives,
May 12, 1910.

The President of the United States having returned to the House of Representatives in which it originated the bill (H. R. 15444) "An Act extending the time for the construction of a dam across Rainy River," with his objections thereto, the House proceeded in pursuance of the Constitution to reconsider the same; and

Resolved, That the said bill pass, two-thirds of the House of Representatives agreeing to pass the same.

Attest:

A. McDowell, *Clerk.*

In the Senate of the United States,
May 23, 1910.

The Senate having proceeded in pursuance of the Constitution to reconsider the bill entitled "An Act extending the time for the construction of a dam across Rainy River," returned to the House of Representatives by the President of the United States with his objections, and sent by the House of Representatives to the Senate, with the message of the President returning the bill;

Resolved, That the bill do pass, two-thirds of the Senate agreeing to pass the same.

Attest:

Charles G. Bennett,
Secretary.

By H. M. Rose,
Asst. Secy.

(53)

Mar. 16, 1906. Vol. 34, p. 65.

[S. 4128.] [Public, No. 49.]

CHAP. 953.—An Act Permitting the building of a dam across the Red Lake River at or near the junction of Black River with said Red Lake River in Red Lake County, Minnesota.

Red Lake River, Minn. Dam by William J. Murphy authorized. Location.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to William J. Murphy, his successors and assigns, to build a dam across the Red Lake River at or near the junction of the Black River, so called, with said Red Lake River, in Red Lake County, Minnesota, for the development of water power, and such works and structures in connection therewith as may be necessary or convenient in the development of said power and in the utilization of the power thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said William J. Murphy, his successors or assigns, shall not deviate from such plans after such approval, either before or after the completion of said structures, unless the modification of said plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges: *And provided further*, That the dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time, without compensation, control the said dam so far as shall be necessary for purposes of navigation, but shall not destroy the water power developed by said dam and structures to any greater extent than may be necessary to provide proper facilities for navigation, and that the Secretary of War may at any time require and enforce at the expense of the owners such modifications and changes in the construction of such dam as he may deem advisable in the interests of navigation: *And provided further*, That suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained at said dam by the said William J. Murphy, his successors or assigns.

Provisos. Secretary of War to approve plans. Modification of plans. Sluiceway. Lock. Changes. Fishways.

Litigation.

SEC. 2. That in case any litigation arises from the building of said dam, or from the obstruction of said river by said dam or appurtenant works, cases may be tried in the proper courts, as now provided for that purpose in the State of Minnesota and in the courts of the United States: *Provided*, That nothing in this Act shall be so construed as to repeal or modify any of the provisions of law now existing in reference to the protection

Proviso. Existing laws not affected.

of the navigation of rivers, or to change said structures from the operation of same.

SEC. 3. That this Act shall be null and void unless the dam herein authorized be commenced within one year and be completed within three years from the time of the passage of this Act.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved March 16, 1908.

34

CHAP. 34.—AN ACT Permitting the building of a dam across the Rock River at Grand Detour, Illinois.

Feb. 21, 1908.
H. R. 18[illegible].
Public, No. 34.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Sylvester B. Newberry and George A. Blanchard, both of the city of Sandusky, Erie County, Ohio, and Charles H. Hughes, of Dixon, Lee County, Illinois, their heirs, successors, and assigns, to build, operate, and maintain a dam across Rock River near Grand Detour, Illinois, at any point within the mile distant from the center of section twenty, township twenty-one north, range nine east of the fourth principal meridian, in the State of Illinois, for the development of water power and such works and structures in connection therewith as may be necessary to operate in the development of said power and in the utilization of the power thereby developed, and the said Sylvester B. Newberry, George A. Blanchard, and Charles H. Hughes, their heirs, successors, and assigns, are hereby authorized and empowered to draw and utilize by canal, flume, or pipe from the point thereof in the construction of the above dam and works herein mentioned such supply of water as may be required for the development and utilization of said water power and to discharge said water through the canal constructed in Grand Detour and discharge the same into said Rock River at or near the westerly end of said canal constructed and for the that purpose to construct, operate, and maintain such structures and appurtenances as may be required: *Provided*, That the plans for the construction of the said dam, canal, and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of the same: *And provided further*, That the said Sylvester B. Newberry, George A. Blanchard, and Charles H. Hughes, their heirs, successors, and assigns shall not divert from said dam more than eighty cubic feet per second, nor shall the construction of the structures herein authorized cause the construction of said dam shall date

Rock River.
Dam, etc., at Grand Detour, Ill., authorized.

Use of water supply.

Provisos.
Approval of plans.
War to approve plans, etc.

Limitation.

been previously submitted to and received the approval of the Chief of Engineers and Secretary of War: *And provided further*, That suitable fishways shall be constructed and maintained by the grantees under the Act at their own expense, as may be required from time to time by the United States Fish Commission: *And provided further*, That the said dam shall be so constructed that the Government of the United States may at any time construct in connection therewith a suitable lock for navigation purposes, and may at any time control the said dam so far as shall be necessary for the purposes of navigation, but shall not destroy or impair the water power developed by said dam, canal, and appurtenant structures to a greater extent than shall be necessary to provide proper facilities for navigation, and other purposes of public interest.

Fishways.

Lock.

Litigation.

SEC. 2. That in case any litigation arises from the building, operation, and maintenance of said dam, canal, and appurtenant works, or from the obstruction of the river by the same, or any damages resulting to private property by overflow or otherwise, proceedings to adjust, determine, and to recover compensation for such damages shall be instituted either in the State or Federal courts.

Time of construction.

SEC. 3. That this Act shall be null and void unless the dam, canal, and appurtenant works herein authorized be commenced within three years and completed within six years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 16, 1906.

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(55)

Mar. 3, 1905. Vol. 33, p. 1004.

CHAP. 1438.—An Act Authorizing the construction of a dam across Rock River at Lyndon, Illinois.

[H. R. 15440.] [Public, No. 171.]

Rock River, Ill. Dam authorized across, at Lyndon.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That permission be given to Edward A. Smith, Harvey S. Green, and John J. Hurlbert, of Morrison, Illinois, or their assigns, to erect a dam with an eight-foot head across Rock River at or near Lyndon, Whiteside County, Illinois, the south end of said dam to be located near the line between sections twenty-one and twenty-two in town twenty north of range five east of the fourth principal meridian, and the north end of said dam to intersect the bank of said river in section twenty-one in the same town, range, and meridian: *Provided*, That the plans for the construction of said dam shall be submitted to and approved by the Chief of Engineers and the Secretary of War, and until approved by them the co[illegible]ction of the dam shall not be commenced; and af[illegible] the p[illegible]oval the plans shall not be changed, either [illegible] the protectio[illegible]

Provisos. Secretary of War to approve plans, etc.

completion of the structure, unless authorized by the Chief of Engineers and the Secretary of War, and the Secretary of War may at any time require and enforce at the expense of the owners of the structure such modifications and changes in said structure as he may deem advisable in the interest of navigation: *Provided further*, That the Secretary of War may at any time require the grantees under this Act to construct at their own expense in connection with said dam suitable locks, canals, sluiceways, or other structures, for the passage of boats and other water craft, the said structures to be built upon plans which he may approve; and the said grantees shall maintain and operate said locks, canals, and other structures at their own expense, and shall pass all water craft through the same without delay and without any charge whatever as long as said dam is maintained; and if said dam and other structures shall be abandoned by the said grantees at any time, all portions thereof shall be promptly removed by the grantees at their own expense.

Locks, etc.

SEC. 2. That before entering upon the construction of the works herein authorized compensation shall be made to any person, firm, or corporation whose lands or other property may be taken, overflowed, or otherwise damaged by the construction, maintenance, and operations of the said works in accordance with the laws of the State where such lands or other property may be situated, and if any litigation arises from the construction, operation, or maintenance of the said works, cases may be tried in the proper courts, as now provided for that purpose in the State of Illinois and the courts of the United States.

Payment for damages.

Litigation.

SEC. 3. That such suitable fishways shall be constructed and maintained by the grantees under this Act at their own expense as may be required from time to time by the United States Fish Commission.

Fishways.

SEC. 4. That this Act shall be null and void if actual construction of the dam herein authorized be not commenced within two years and completed within four years from the date hereof.

Time of construction.

SEC. 5. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 3, 1905.

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(56)

CHAP. 1201.—An Act Permitting the building of a dam across Rock River at Lyndon, Illinois.

Feb. 25, 1907.
Vol. 34, p. 933.

[H. R. 25234.]
[Public, No. 124.]

Rock River.
Edward A. Smith et al. may dam, at Lyndon, Ill.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Edward A. Smith, Harvey S. Green, and John J. Hurlbert, of Morrison, Illinois, their heirs, administrators, executors, successors, and assigns, are hereby authorized to construct and maintain a dam across Rock River at or

near Lyndon, Whiteside County, Illinois, the south end of said dam to be located near the line between sections twenty-one and twenty-two in township twenty north, range five east, fourth principal meridian, and the north end of said dam to intersect the bank of said river in section twenty-one in the same township, range, and meridian, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 25, 1907.

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(57)

May 1, 1906.
Vol. 34, p. 155.

[H. R. 14508.]
[Public, No. 137.]

CHAP. 2072.—An Act Permitting the building of dams across the north and south branches of Rock River, adjacent to Vandruffs Island and Carrs Island, and across the cut-off between said islands, in Rock Island County, Illinois, in aid of navigation and for the development of water power.

Rock River, Ill. Samuel S. Davis may dam, in Rock Island County.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Samuel S. Davis, of the city of Rock Island, in the county of Rock Island and State of Illinois, his heirs, executors, administrators, and assigns, to build, operate, and maintain dams across the north and the south branches or channels of Rock River adjacent to Vandruffs Island and to Carrs Island, and across the cut-off between said islands, in said county of Rock Island, State of Illinois, in aid of navigation and for the development of water power, together with such works and structures in connection therewith as may be necessary or convenient in the development of said power and the utilization of the power thereby developed; said dams may be built at or near the sites of the dams formerly existing across said branches and said cut-off, or at any place or places between said sites and the dams now constructed at or near the head of said Carrs Island for the purposes of the Illinois and Mississippi Canal, and the said Samuel S. Davis, his heirs, executors, administrators, and assigns are hereby authorized and empowered to draw and divert by canal, flume, or race, or canals, flumes, and races, from the pool formed by the construction of said dams and works incident thereto, such supply of water as may be required for the full and complete development and utilization of said water power, and to discharge the same into said Rock River or some branch or channel thereof at or near the lower part of said Vandruffs Island, or at some place or places on or near the north shore of said river or of the north branch or channel thereof opposite to or below said Vandruffs Island; and also for that purpose to construct, operate,

Location.

Canal, etc.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Dam across South Branch of Rock River

said Carrs Island: *And provided further*, That the Secretary of War is hereby authorized, if in his judgment the interests of the United States will not be injured thereby, to permit the dam across the south branch of Rock River to be located and built on land belonging to the United States, under and subject to such terms and conditions as he may consider just and reasonable.

Litigation.

SEC. 2. That in case any litigation arises from the building, operation, and maintenance of said dams, canals, and appurtenant works, or from the obstruction of said river by the same, or any damages resulting to private property by overflow or otherwise, proceedings to adjust, determine, and recover compensation for such damages may be instituted in any court of competent jurisdiction.

Time of construction.

SEC. 3. That unless the actual construction of the dams herein authorized shall be commenced within one year and completed within three years after the passage of this Act, the rights and privileges herein granted, so far as they pertain to the construction of any dam or dams not then completed, shall cease and determine.

Amendment.

SEC. 4. That the right to alter, amend, and repeal this Act is hereby expressly reserved.

Approved, May 1, 1906.

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(58)

[Extract from river and harbor act approved March 2, 1907. Stats. L., Vol. 34, p. 1103.]

Rock River, Ill. Dam authorized across, at Sterling.

The Secretary of War is authorized to permit the Sterling Hydraulic Company, of Sterling, Illinois, to erect, own, and operate a power station in connection with the dam built or to be built by the United States in Rock River at or near Sterling, Illinois, in connection with the construction of the Illinois and Mississippi Canal: *Provided*, That the location and plans of said power station shall be subject to the approval of the Secretary of War: *Provided further*, That the navigation of Rock River and of the Illinois and Mississippi Canal and the operation and maintenance of said dam shall be in no way obstructed thereby: *And provided further*, That prior to the issue of said permit the Sterling Hydraulic Company shall waive any and all claims that it may have against the United States by reason of the construction, operation, and maintenance of the Illinois and Mississippi Canal, except such claims as it may have for the abstraction from Rock River of more than three hundred cubic feet of water per second when the flow of Rock River immediately above is less than one thousand cubic feet of water per second.

Provisos. Approval of location, etc.

Navigation not to be obstructed.

Condition.

59

AN ACT—Permitting the building of a dam across the St. Croix River at or near the village of St. Croix Falls, Polk County, Wisconsin.

Feb. 7, 1907.
Vol. 34, p. 901.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to St. Croix Falls Wisconsin Improvement Company, a corporation organized under the laws of the State of Wisconsin, and to St. Croix Falls Minnesota Improvement Company, a corporation organized under the laws of the State of Minnesota, or either of them, their and each of their successors or assigns, to build a dam across the St. Croix River at or near the St. Croix Falls, so called, in said river, and all works incident thereto in the utilization of the power thereby developed: *Provided*, That the plans for the construction of said dam and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of said dam: *And provided further*, That said St. Croix Falls Wisconsin Improvement Company and said St. Croix Falls Minnesota Improvement Company, or either of them, their and each of their successors or assigns shall not deviate from such plans after such approval under before or after the completion of the structure, unless the modification of said plans shall have previously been submitted to and received the approval of the Chief of Engineers and of the Secretary of War: *And provided further*, That there shall be placed and maintained in connection with said dam a suitable way so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam, without unreasonable delay or hindrance, and without toll or charge: That the Government of the United States may, at any time, construct in connection therewith a suitable lock for navigation purposes, may at any time without compensation control the said dam for purposes of navigation, but shall not destroy the water power created by said dam to any greater extent than may be necessary to provide proper facilities for navigation: and that the Secretary of War may, at any time, require and enforce, at the expense of the owners, such modifications and changes in the construction of said dam and may make such regulations for the operation of said dam as he may deem advisable in the interests of navigation.

St. Croix River, Wis.
St. Croix Falls Wisconsin Improvement Co., et al., may dam at St. Croix Falls.

Provisos.
Plans to be approved by the Secretary of War.

Construction of slideway.

Alter navigation.

Changes.

Sec. 2. That in case any injuries arise from the building of said dam or from the construction of said river by said dam or appurtenant works cases may be tried in the proper courts as now provided for that purpose in the States of Wisconsin and Minnesota and in the courts of the United States.

Litigation.

Sec. 3. That this act shall be null and void unless the dam herein authorized be commenced within two years

Time of construction.

and completed within five years from the time of the passage of this Act.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, February 7, 1903.

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(60)

Apr. 5, 1906.
Vol. 34, p. 102.

[H. R. 16671.]
[Public, No. 85.]

CHAP. 1368.—An Act Permitting the building of a dam across the Saint Joseph River near the village of Berrien Springs, Berrien County, Michigan.

St. Joseph River, Mich.
Berrien Springs Power and Electric Company may dam.
Location.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to the Berrien Springs Power and Electric Company, a corporation organized under the laws of the State of Michigan, its successors and assigns, to construct, erect, and maintain a dam across the Saint Joseph River, in Berrien County, in the State of Michigan, at any point within two miles south of the highway bridge at Berrien Springs, together with all necessary works appurtenant thereto:

Provisos.
Secretary of War to approve plans, etc.

Provided, That the plans of said dam shall be submitted to and be approved by the Chief of Engineers and the Secretary of War before construction is commenced; and the Secretary of War may at any time require and enforce, at the expense of the owners, such modifications in the construction of said dam as he may deem advisable in the interest of navigation: *Provided further*, That there shall be placed and maintained in connection with said dam a sluiceway so arranged as to permit logs, timber, and lumber to pass around, through, or over said dam without unreasonable delay or hindrance and without toll or charges, and suitable gates, weirs, and sluices shall be provided in said dam and shall be so operated as to furnish at all times the flow of water necessary for the navigation of the Saint Joseph River below Berrien Springs; and suitable fishways, to be approved by the United States Fish Commission, shall be constructed and maintained on said dam.

Sluiceway

Fishways.

Damages.

SEC. 2. That before the construction of said dam shall be begun, the permission of the board of supervisors of Berrien County, Michigan, shall be obtained thereto, and compensation shall be made for all property taken or damages thereby occasioned according to the laws of the State of Michigan.

Time of construction.

SEC. 3. That this Act shall be null and void unless the dam herein authorized is commenced within one year and completed within three years from the date hereof.

Amendment.

SEC. 4. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, April 5, 1906.

(61)

CHAP. 2579.—An Act To authorize Herman L. Hartenstein to construct a dam across the Saint Joseph River, near the village of Mottville, Saint Joseph County, Michigan.

Mar. 2, 1907.
Vol. 34, p. 1254

[H. R. 25832.]
[Public, No. 238.]

St. Joseph River, Mich.
Herman L. Hartenstein may dam, at Mottville.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That Herman L. Hartenstein, a citizen of the State of Michigan, his heirs and assigns, be, and they are hereby, authorized to construct, maintain, and operate a dam across the Saint Joseph River, at any point up the stream within one mile from the highway bridge at the village of Mottville, Saint Joseph County, in the State of Michigan, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Amendment.

Approved, March 2, 1907.

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(62)

CHAP. 2555.—An Act Permitting the building of a dam across the Savannah River at Andersonville Shoals.

Mar. 2, 1907.
Vol. 34, p. 1240.

[H. R. 25848.]
[Public, No. 214.]

Savannah River.
J. R. Earle Development Company may dam, at Andersonville shoals.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the J. R. Earle Development Company, a corporation to be organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River, extending from a point in Hart County, Georgia, to a point in Anderson County, South Carolina, upon or in the vicinity of Andersonville Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Amendment

Approved, March 2, 1907.

(63)

Mar. 2, 1907. Vol. 34, p. 1240.

CHAP. 2553.—An Act Permitting the building of a dam across the Savannah River at Calhoun Falls.

[H. R. 25846.] [Public, No. 212.]

Savannah River. Hugh MacRae Company may dam, at Calhoun Falls.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Hugh MacRae Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in Abbeville County, South Carolina, upon or in the vicinity of Calhoun Falls, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, March 2, 1907.

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(64)

Mar. 2, 1907. Vol. 34, p. 1255.

CHAP. 2580.—An Act Permitting the building of a dam across the Savannah River at Cherokee Shoals.

[H. R. 25849.] [Public, No. 230.]

Savannah River, Ga. and S. C. Hugh MacRae Company may dam, at Cherokee shoals.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Hugh MacRae Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in Abbeville County, South Carolina, upon or in the vicinity of Cherokee Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, March 2, 1907.

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(65)

Feb. 8, 1901. Vol. 31, p. 763.

CHAP. 344.—An Act Permitting the building of two dams across the Savannah River above the city of Augusta in the State of Georgia.

Twin City Power Co. may dam Savannah River at Dortons Creek, S. C.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby granted to Twin City Power Company, a corporation organized under the laws of the State of South Carolina, its successors or

[illegible] to construct, own and maintain a dam across the Savannah River at or near where Dorsey Creek in the county of Edgefield, State of South Carolina, empties into the Savannah River and all works incident thereto in the utilization of the power thereby developed; and also a dam across the said river at or near the southern end of Prices Island in said river, and about five miles from the mouth of Dorsey Creek and all works incident thereto in the utilization of the power thereby developed: *Provided*, That each of the dams constructed shall be provided with an adequate lock of such capacity as may be prescribed by the Secretary of War: *Provided also*, That the plans for the construction and maintenance of said dams and appurtenant works shall be submitted to and approved by the Chief of Engineers and the Secretary of War before the commencement of the construction of such dam or dams, and that the said Twin City Power Company shall not divert from such plans after such approval, either before or after completion of the same, unless the modification of said plans shall have previously been submitted to and receive the approval of the Chief of Engineers and of the Secretary of War: *Provided further*, That in case any litigation arises from the building of said dam or dams, the maintenance of the same, or from the construction of said river by the said dam or dams or appurtenant works, cases may be tried in the proper courts as now provided for such purpose in the States of South Carolina and Georgia, and the courts of the United States.

Sec. 2. That the right to amend or repeal this Act is hereby expressly reserved: *And provided further*, That suitable fishways shall be constructed and maintained at said dams by said company, its successors and assigns, as may be required from time to time by the United States Fish Commission.

Sec. 3. That this Act shall be null and void unless one of the said dams herein authorized shall be completed within five years from the passage of this Act, and unless both dams shall be completed within the same time the rights and privileges hereby granted shall cease and be determined so far as pertains to the uncompleted dam: *And provided further*, That said dam or dams shall be constructed in such manner as not to injure or diminish the water power of any person or company having a dam or dams or works already constructed: *And provided further*, That before the construction of either of said dams compensation shall be made to any person or company whose lands may be taken or overflowed in the construction or maintenance of said dam or dams, in accordance with the laws of the State where said lands may be situate.

Approved, February 4, 1911.

Dam at Prices Island, etc.

Provisos.

Locks.

Secretary of War to approve plans, etc.

Litigation.

Amendment.

Provisos.

Fishways.

Completion.

Provisos.

No injury to existing individual works.

Damages.

Feb. 27, 1907.
Vol. 34, p. 1000.

[S. 8182.]
[Public, No. 134.]

CHAP. 2074.—An Act Authorizing the Twin City Power Company to build two dams across the Savannah River above the city of Augusta, in the State of Georgia.

Savannah River.
Twin City Power Company may dam, at Dortons Creek and at Prices Island, S. C.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Twin City Power Company, a corporation organized under the laws of the State of South Carolina, its successors and assigns, be, and they are hereby, authorized to construct, maintain, and operate a dam across the Savannah River, at or near where Dortons Creek, in the county of Edgefield, State of South Carolina, empties into the Savannah River, and also a dam across the said river at or near the southern end of Prices Island in said river and about five miles from the mouth of Dortons Creek in the State of South Carolina, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six: *Provided*, That one of said dams shall be completed within three years, and the other within five years from the passage of this Act.

Vol. 34, p. 386.

Proviso.
Time of construction.

Amendment.

SEC. 2. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, February 27, 1907.

February 29, 1908.
[S. 3726.]

[Public, No. 36.]
Vol. 35, p. 36.

CHAP. 55.—An Act To authorize the Twin City Power Company to build, operate, and maintain three dams across the Savannah River, above the city of Augusta, in the State of Georgia.

Savannah River.
Twin City Power Company may dam.
Dortons Creek, S. C.
Prices Island, S. C.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Twin City Power Company, a corporation organized under the laws of the State of South Carolina, its successors and assigns, be, and they are hereby, authorized to construct, maintain, and operate a dam across the Savannah River, at or near where Dortons Creek, in the county of Edgefield, State of South Carolina, empties into the Savannah River, and also a dam across the said river at or near the southern end of Prices Island, in said river, and about five miles from the mouth of Dortons Creek, in the State of South Carolina, in accordance with the provisions of the Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six: *Provided*, That one of said dams shall be completed within three years and the other within five years from the passage of this Act.

Vol. 34, p. 386.

Proviso.
Time of completion.

Crouchs Bluff.

SEC. 2. That the said Twin City Power Company is authorized to construct, operate, and maintain a dam across the Savannah River at what is known as Crouchs Bluff, in Edgefield County, South Carolina: *Provided*, That the said site at Crouchs Bluff can be obtained by contract from the owners thereof: *And provided further*,

Provisos.
Site.

That said dam at Crouche Bluff shall be constructed under the provisions of the said Act of June twenty-first, nineteen hundred and six: *Provided further*, That said dam if constructed at Crouche Bluff shall be completed within three years. Vol. 34, p. 1000. Time of completion.

SEC. 3. That the Act entitled "An Act authorizing the Twin City Power Company to build two dams across the Savannah River, above the city of Augusta, in the State of Georgia," approved February twenty-seventh, nineteen hundred and seven, be, and the same is hereby, repealed. Former act. Vol. 34, p. 1000.

SEC. 4. That the right to alter, amend, or repeal this Act is hereby expressly reserved. Amendment.

Approved, February 20, 1908.

46

CHAP. 460.—An Act Permitting the building of a dam across the Savannah River at Clark Shoals. Feb. 1, 1907. Vol. 34, p. 870.

H. R. 23407. Public, No. 181.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Savannah River Power Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in South Carolina near the dividing line between Anderson County, South Carolina, and Abbeville County, South Carolina, upon or in the vicinity of Clark Shoals, and all works incident thereto in the utilization of the power thereby developed in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six. Savannah River, Ga. and S. C. Savannah River Power Company may dam, at Clark Shoals. Vol. 34, p. 386.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved. Amendment.

Approved, February 1, 1907.

47

CHAP. 256.—An Act Permitting the building of a dam across the Savannah Tugaloo River at Hartwell Fort. Mar. 1, 1907. Vol. 34, p. 1200.

H. R. 23407. Public, No. 181.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Hugh MacRae Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Hart County, Georgia, to a point in Anderson Savannah River, Tugaloo River. Hugh MacRae Company may dam, at Hartwell Fort.

County, South Carolina, upon or in the vicinity of Hattons Ford, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, March 2, 1907.

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(68)

Mar. 2, 1907. Vol. 34, p. 1238.

CHAP. 2549.—An Act Permitting the building of a dam across the Savannah River at McDaniel Shoals.

[H. R. 25773.] [Public, No. 208.]

Savannah River. Anderson Guaranty and Trust Company may dam, at McDaniel shoals.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Anderson Guaranty and Trust Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Hart County, Georgia, to a point in Anderson County, South Carolina, upon or in the vicinity of McDaniel Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

Vol. 34, p. 386.

Amendment.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved.

Approved, March 2, 1907.

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(69)

Mar. 2, 1907. Vol. 34, p. 1239.

CHAP. 2551.—An Act Permitting the building of a dam across the Savannah River at Middleton Shoals.

[H. R. 25776.] [Public, No. 210.]

Savannah River. Anderson Guaranty and Trust Company may dam, at the Middleton shoals.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Anderson Guaranty and Trust Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in Anderson County, South Carolina, upon or in the vicinity of Middleton Shoals, and all work incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act

Vol. 34, p. 386.

to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six.

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved. Amendment.

Approved, March 2, 1907.

70

CHAP. [illegible].—An Act Permitting the building of a dam across the Savannah River at Trotters Shoal. Mar. 2, 1907. Vol. 34, p. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the High WarRae Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in Abbeville County, South Carolina, upon or in the vicinity of Trotters Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six. H. R. [illegible]. Public, No. [illegible]. Savannah River. High WarRae Company may dam, at Trotters shoals. Vol. 34, p. [illegible].

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved. Amendment.

Approved, March 2, 1907.

71

CHAP. [illegible].—An Act Permitting the building of a dam across the Savannah River at Turner Shoals. Mar. 2, 1907. Vol. 34, p. [illegible].

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Anderson Guaranty and Trust Company, a corporation organized under the laws of South Carolina, its successors and assigns, is hereby authorized to construct and maintain a dam across the Savannah River extending from a point in Elbert County, Georgia, to a point in Abbeville County, South Carolina, upon or in the vicinity of Turner Shoals, and all works incident thereto in the utilization of the power thereby developed, in accordance with the provisions of an Act entitled "An Act to regulate the construction of dams across navigable waters," approved June twenty-first, nineteen hundred and six. H. R. [illegible]. Public, No. [illegible]. Savannah River. Anderson Guaranty and Trust Company may dam, at Turner shoals. Vol. 34, p. [illegible].

SEC. 2. That the right to amend or repeal this Act is hereby expressly reserved. Amendment.

Approved, March 2, 1907.

(72)

Mar. 3, 1905.
Vol. 33, p. 1006.

[H. R. 15609.]
[Public, No. 173.]

CHAP. 1440.—An Act Providing for the acquirement of water rights in the Spokane River along the southern boundary of the Spokane Indian Reservation, in the State of Washington, for the acquirement of lands on said reservation for sites for power purposes and the beneficial use of said water, and for other purposes.

Spokane River, Wash.
Use of waters.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the right to the use of the waters of the Spokane River where the said river forms the southern boundary of the Spokane Indian Reservation may, with the consent of the Secretary of the Interior, be acquired by any citizen, association, or corporation of the United States by appropriation under and pursuant to the laws of the State of Washington.

Spokane Indian Reservation.
Grant of lands of, for dams, etc

SEC. 2. That the Secretary of the Interior be, and he hereby is, authorized and empowered to grant such appropriator or appropriators land on said reservation, whether the same has been allotted in severalty to any individual Indians, but which has not been conveyed to the allottee with full power of alienation, or whether the same remains unallotted, on the north bank of the said Spokane River, such as shall be necessary and requisite for overflow rights and for the erection of suitable water, electrical, or power plants, dams, wing walls, flumes, or other needful structures required for the development of power or for the beneficial use of said water: * * *

* * * * *

Rules, etc.

SEC. 5. That the Secretary of the Interior shall make all needful rules and regulations not inconsistent herewith for the proper execution and carrying into effect of this Act.

Approved, March 3, 1905.

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(73)

[Tennessee River, Elk River shoals to Florence railway bridge. Extract from river and harbor act approved March 2, 1907. Stats. L., vol. 34, p. 1094.]

Colbert and Bee Tree shoals, Ala.
Proviso.
Contract.

Improving Tennessee River at Colbert and Bee Tree shoals, Alabama: Continuing improvement, two hundred thousand dollars: *Provided,* That the Secretary of War may enter into a contract or contracts for such materials and work as may be necessary for the completion of said project, to an amount not exceeding two hundred and thirteen thousand dollars, exclusive of the amounts herein and heretofore appropriated or authorized. *And the Secretary of War may appoint a Board of Engineers whose duty it shall be to examine the present condition of the United States canal and the Tennessee River from the head of Elk River Shoals to the Florence Railway bridge*

Board to examine conditions, etc.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

whatsoever, except for expenses connected with the preparation of plans and the superintendence, as provided in section five of this Act, and further excepting the cost of the lock gates and ironwork and machinery necessary to operate the lock when completed, which shall be furnished by the United States.

Time of construction.

SEC. 2. That the said municipality, corporation, company, or individuals undertaking the construction of said work shall begin the building of said lock and dam within eighteen months from the passage of this Act, and the same shall be completed within four years from the date of beginning the construction, the right being reserved to the United States to enter on the construction of said lock and dam if deemed advisable at any time before the work is commenced by said contracting parties; or if begun and not carried on in strict accordance with the directions of the Secretary of War, then the United States may assume the further construction and completion of said work at its option, the cost of such further construction and completion to be paid by the said contracting municipality, corporation, company, or individuals.

United States may construct.

Delivery of deed.

SEC. 3. That the deed to the United States to the land to be purchased and donated to the same, as mentioned in the first section of this Act, shall be executed and delivered within twelve months after the passage of this Act; and, further, that the Secretary of War shall determine from time to time whether the work is being properly done, and may require an increase in force to be employed by the contractor so as to force the work to completion within the limit mentioned in the Act.

Use of water power.

SEC. 4. That in consideration of the construction of said lock and dam, free of cost to the United States except as provided in section one of this Act, the United States hereby grants to the municipality, corporation, company, or persons constructing said lock and dam under the provisions of this Act such rights as it possesses to use the water power produced by said dam, and to convert the same into electric power or otherwise utilize it for a period of ninety-nine years: *Provided*, That it or they shall furnish the necessary electric current while its or their power plant is in operation to move the gates and operate the locks and to light the United States buildings and grounds, free of cost to the United States: *And provided further*, That the plans for the necessary works and structures to utilize said water power shall be approved by the Secretary of War, and that nothing shall be done in the use of the water from said dam or otherwise to interfere with or in any way impede or retard the proper and complete navigation of the river at all times, nor in any way to interfere with the use and control of the same by the United States for the purposes of navigation: *And provided further*, That

Provisos.
Electric current to be supplied free to Government buildings, etc.

Unobstructed navigation.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

Extension of time for construction.

SEC. 6. That in the event the city of Chattanooga undertakes the erection of said lock and dam the Secretary of War shall extend the time provided herein for beginning the work on the same for a period not exceeding twelve months from the passage of the enabling act that the general assembly of the State of Tennessee may pass at its next regular session, enabling said municipality to undertake said work, if the same be necessary; and in the same event he shall extend the time for the completion of said lock and dam twelve months.

Right of revocation reserved.

SEC. 7. That the right is expressly reserved in the United States to revoke by Act of Congress the rights privileges, and benefits conferred by this Act; but in the event of such revocation the United States shall pay to the municipality, corporation, company, firm, or persons who may erect said lock and dam under the provisions of this Act, as full compensation, the reasonable value, exclusive of the franchise hereby conferred, of all properties erected and lands purchased by them necessary for the enjoyment of the benefits conferred upon them by the provisions of this Act, such value to be determined by mutual agreement between the Secretary of War and the owners of said properties, and in case they can not agree, then by proceedings instituted in the United States circuit court for the condemnation of said property, such proceedings to conform as nearly as may be to the laws of the State of Tennessee in respect of condemning land for the right of way for railroad purposes: *Provided*, That to insure compliance with the terms of the contract or of this Act, or to protect the interests of navigation, the Secretary of War shall have power at any time, before or after the completion of the work, to order a suspension of all privileges granted by this Act: *And provided further*, That compliance with such order of suspension may be enforced by the injunction of the circuit court of the United States exercising jurisdiction in the district in which the work is situated, and proper proceedings to this end shall be instituted by the Attorney-General upon request of the Secretary of War.

Indemnification.

Provisos.
Suspension of privileges.

Enforcement by injunction.

Existing laws not affected.

SEC. 8. That nothing in this Act shall be construed as in any way interfering with the exclusive jurisdiction over and control by the United States of the Tennessee River and the lock and dam therein to be erected for the purpose of navigation, nor as repealing or modifying any of the provisions of law now existing in reference to the protection of navigation.

Approved, April 26, 1904.

[Hales bar dam.]

CHAP. 32.—An Act To amend an Act approved April twenty-sixth, nineteen hundred and four, entitled "An Act to enable the Secretary of War to permit the erection of a lock and dam in aid of navigation in the Tennessee River near Chattanooga, Tennessee, and for other purposes."

Jan. 7, 1905.
Vol. 33, p. 603.

[H. R. 15590.]
[Public, No. 6.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Act of Congress approved April twenty-sixth, nineteen hundred and four, entitled "An Act to enable the Secretary of War to permit the erection of a lock and dam in aid of navigation in the Tennessee River near Chattanooga, Tennessee, and for other purposes," be, and the same is hereby, amended by inserting in section one, line seven, after the words "Scott Point," "near Chattanooga, Tennessee," and before the word "under,' the following: "or at such other point or place in the mountain section of said river below Scott Point as the Secretary of War may approve."

Tennessee River, Tenn.
Construction of lock and dam in, near Chattanooga.
Vol. 33, p. 309.

Location.

Approved, January 7, 1905.

[Extract from river and harbor act approved March 3, 1905. Stats. L., Vol. 33, p. 1133.]

Improving Tennessee River, Tennessee: Continuing improvement by the partial construction of lock gates at the lock projected at or near Scotts Point, together with the cost of superintendence and the preparation of plans to be made by the United States, ten thousand dollars: *Provided*, That a contract or contracts may be entered into by the Secretary of War for such materials and work as may be necessary for the further prosecution of said work, to be paid for as appropriations may from time to time be made by law, not to exceed in the aggregate forty thousand dollars exclusive of the amount herein appropriated.

Scott Point.
Lock gates.

(Hales bar.)

Proviso.
Contracts.

[Extract from river and harbor act approved March 2, 1907. Stats. L., Vol. 34, p. 1093.]

Improving Tennessee River at Hales bar, Tennessee: Completing improvement, sixty-two thousand nine hundred and seventy dollars.

Hales bar, Tenn.

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(75)

CHAP. 517.—An Act To authorize the construction of dams and power stations on the Tennessee River at Muscle Shoals, Alabama.

Mar. 6, 1906.
Vol. 34, p. 52.

[H. R. 297.]
[Public, No. 35.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That any person, company, or corporation having authority therefor under the laws of the State of Alabama may hereafter erect, maintain, and use a dam or dams in or across the Tennessee River, in the State of Alabama, at such points at Muscle Shoals as they may elect, and the

Tennessee River.
Dams at Muscle shoals, Ala., authorized.
Vol. 34, p. 1094.

Secretary of War may approve, between a point on the southern side of the river opposite to, or below the head or opening of the canal constructed by the United States on the north side of the river, on the east, and the western line of section sixteen, township three, range ten on the west, for the purpose of erecting, operating, and maintaining power station and to maintain inlet and outlet races or canals and to make such other improvements on the southern bank of the Tennessee River, between the two points above mentioned, as may be necessary for the development of water power and the transmission of the same, subject always to the provisions and requirements of this Act, and to such conditions and stipulations as may be imposed by the Chief of Engineers and the Secretary of War for the protection of navigation and the property and other interests of the United States.

Construction, etc., of power stations.

Secretary of War to approve plans, etc.

SEC. 2. That detailed plans for the construction and operation of a dam or dams and other appurtenant and necessary works shall be submitted by the person, company, or corporation desiring to construct the same to the Chief of Engineers and the Secretary of War, with a map showing the location of such dam or other structures with such topographical and hydrographic data as may be necessary for a satisfactory understanding of the same, which must be approved by the Chief of Engineers and the Secretary of War before work can be commenced on said dam or dams or other structures; and after such approval of said plans, no deviation whatsoever therefrom shall be made without first obtaining the approval of the Chief of Engineers and the Secretary of War: *Provided*, That the constructions hereby authorized do not interfere with the navigation of Muscle Shoals Canal or the navigation of the Tennessee River: *And provided further*, That said dam or dams and works shall be limited only to the use of the surplus water of the river, not required for the navigation of the Muscle Shoals Canal or the Tennessee River, and that no structures shall be built and no operations conducted by those availing themselves of the provisions of this Act which shall injure or interfere with the navigation of the Muscle Shoals Canal or impair the usefulness of any improvement made by the Government in the interest of navigation.

Provisos. Unobstructed navigation.

Restrictions.

Locks, etc.

SEC. 3. That the Government of the United States reserves the right, at any time that the improvement of the navigation of the Tennessee River demands it, to construct, maintain, and operate, in connection with any dam or other works built under the provisions of this Act, suitable lock or locks or any other structures for navigation purposes, and at all times to control such dam or dams or other structures, and the level of the pool caused by such dam or dams, to such an extent as may be necessary to provide facilities for navigation; and whenever Congress shall authorize the construction of such lock or other structures, the person, company, or corpo-

[illegible]

Damages.

[illegible]

[illegible]

Time of commencement.

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

[illegible]

improvement of the above-described stretch of said river by private or corporate agency in conjunction with the development of water power by means of not more than three locks and dams; and the said Board may examine any plans presented by such agency and shall report whether the same, if constructed, can, without injury to navigation, or with advantage thereto, be used to develop water power, and what portion, if any, of the expense of the work should be borne by the United States; and such Board shall report its findings not later than the first Monday in December, nineteen hundred and seven, *and until such Board shall make its report and action shall be taken thereon by Congress no permits shall be issued under the provisions of the Act approved March sixth, nineteen hundred and six, entitled "An Act to authorize the construction of dams and power stations on the Tennessee River at Muscle Shoals, Alabama."*

Report.

Water power. Muscle shoals, permits withheld.

Vol. 34, p. 52.

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(76)

Mar. 3, 1899.

Vol. 30, p. 1351.

CHAP. 437.—An Act Granting to the Muscle Shoals Power Company right to erect and construct canal and power stations at Muscle Shoals, Alabama.

Muscle Shoals Power Co. may construct canal, etc., at Muscle shoals, Ala.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Muscle Shoals Power Company, a corporation created and organized under a charter granted by the legislature of the State of Alabama, its successors or assigns, to erect, construct, operate, and maintain inlet and outlet races or canals and a power station or stations at a point or points at or near the Muscle Shoals in Tennessee River, and to make such other improvements as may be necessary within said limits for the development of water power and transmission of the same: *Provided,* That the constructions hereby authorized do not in any way interfere with the Muscle Shoals Canal, or with navigation of said river: *Provided further,* That until the plans and location of the works herein authorized, so far as they affect the interests of navigation, have been approved by the Secretary of War, the improvements shall not be commenced or built, and the Secretary of War is authorized and directed to fix reasonable charges for use of said power.

Provisos. No interference with Muscle Shoals Canal, etc.

Approval of Secretary of War.

Commencement and completion.

Vols. 31, pp. 274, 846; 32, p. 839.

SEC. 2. That unless the work herein authorized be commenced within one year and completed within three years from the date hereof, the privileges hereby granted shall cease and be determined.

Amendment.

SEC. 3. That the right to alter, amend, or repeal this Act is hereby expressly reserved.

Approved, March 3, 1899.

[illegible]

[illegible]

[illegible]

pany by said first-mentioned Act shall cease and be determined; and the Secretary of War is authorized, in his discretion, to permit the said company to erect and construct dams which may abut on lands of the United States along the line of the Muscle Shoals Canal upon such terms and conditions as may be deemed just and equitable to the public interests.

Construction of dams.

Approved, February 18, 1903.

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(77)

Feb. 14, 1889. Vol. 25, p. 670.

CHAP. 165.—An Act To authorize and empower the Mount Carmel Development Company to draw water from the Wabash River, or its tributaries, in the county of Wabash, and State of Illinois.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Mount Carmel Development Company, a corporation created and existing under the laws of the State of Illinois, be, and the same is hereby, authorized and empowered to construct and operate, during its corporate existence, a hydraulic canal from any point on the Wabash River above the lock and dam now in process of construction at the Grand Rapids of said Wabash River, or from any tributary of said river within the county of Wabash and State of Illinois, to any point on said river within the corporate limits of the city of Mount Carmel, Illinois; and to draw from said Wabash River or tributary thereof such supply of water as may be required for the purposes of such corporation: *Provided*, That such withdrawal be not detrimental to the interests of navigation and be subject to the direction and control of the Secretary of War.

Mount Carmel Development Co. may construct canal from Wabash River, Ill.

Proviso. To be controlled by Secretary of War.

Approved, February 14, 1889.

Feb. 12, 1901. Vol. 31, p. 785.

CHAP. 358.—An Act Authorizing the Mount Carmel Development Company to draw water from Wabash River at Grand Rapids, Wabash County, Illinois.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Mount Carmel Development Company, a corporation chartered by the State of Illinois as of the date of October twenty-sixth, nineteen hundred, be, and the same is hereby, authorized and empowered to draw, by canal, flume, or race, from the pool of the Grand Rapids dam of the Wabash River, in the county of Wabash and State of Illinois, such supply of water as may be necessary or required for the purposes of said corporation during the continuance of said corporation: *Provided*, That such withdrawal of water shall not be so great as to be detrimental to the navigation of said

Mount Carmel Development Co. may draw water from Wabash River at Grand Rapids, Ill.

Provisos. —control of supply, etc.

Wabash River, and shall be under the direction and control of the Secretary of War: *And provided further*, That the said corporation shall submit detailed plans, showing the location and method of construction of said canal, flume, or race, to the Secretary of War for approval; and until he shall approve the same the work hereby authorized shall not be commenced.

Secretary of War to approve plans.

Approved, February 12, 1901.

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(78)

CHAP. 3564.—An Act Granting to the Batesville Power Company right to erect and construct canal and power stations at Lock and Dam Numbered One, upper White River, Arkansas.

June 28, 1906. Vol. 34, p. 536.

[H. R. 13106.] [Public, No. 313.]

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the consent of Congress is hereby given to the Batesville Power Company, a corporation created and organized under a charter granted by the State of Arkansas, its successors or assigns, to erect, construct, operate, and maintain inlet and outlet races, canals, or other structures and a power station or stations at or near Lock and Dam Numbered One, upper White River, Arkansas, and to make such other improvements as may be necessary for the development of water power from Pool Numbered One, and the transmission or application of the same: *Provided*, That the constructions hereby authorized are not built on any lands belonging to the United States and do not in any way impair the usefulness of any improvement made by the Government for the benefit of navigation: *Provided further*, That in the operation of the aforesaid constructions the withdrawal of water from the river shall at all times be under the direction and control of the Secretary of War, and that until the plans and location of the works herein authorized, so far as they affect the interests of navigation, have been approved by the Secretary of War, the improvements shall not be commenced or built, and the Secretary of War is authorized and directed to fix from time to time reasonable charges to be paid by said company for the use of said power.

White River, Ark. Batesville Power Company may construct canal, etc., at Lock and Dam No. 1 for power station.

Provisos. Condition.

Control of water.

SEC. 2. That unless the work herein authorized be commenced within one year and completed within three years from the date hereof the privileges hereby granted shall cease and be determined.

Time of construction.

SEC. 3. That the right to alter, amend, or repeal this Act is expressly reserved.

Amendment.

Approved, June 28, 1906.

(79)

June 29, 1906.
Vol. 34, p. 628.

[H. R. 18596.]
[Public, No. 368.]

CHAP. 3622.—An Act To enable the Secretary of War to permit the erection of a lock and dam in aid of navigation in the White River, Arkansas, and for other purposes.

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That the Secretary of War be, and he is hereby, authorized and empowered to grant permission to J. A. Omberg, junior, to build and construct a lock and dam across the White River at such point above Lock Numbered Three, now built or being built by the United States, as may be approved by the Secretary of War, the said lock and dam to be constructed under his direction, supervision, and control, and in accordance with and conformity to the plans and designs as may be approved by the Chief of Engineers of the United States Army: *Provided,* That the plans and designs of the said structure shall be prepared by the said contracting party at his own expense; and the said contracting party shall purchase and pay for all lands on either side of the river that may be necessary to the successful construction and operation of said lock and dam, including flowage rights and rights of way for ingress and egress from public highways, and deed the same to the United States, and make all excavations, erect all stone, concrete, and timber work, furnish all materials of every character, and pay for all labor employed in the construction of said lock and dam, and give said lock and dam to the United States completed, free of all cost, expense, claims, or charges of any kind whatsoever.

White River, Ark.

J. A. Omberg, jr., may build lock and dam across.

Proviso.
Plans, etc.

Construction.

Transfer free of cost.

SEC. 2. That the said individual undertaking the construction of said work shall begin the building of said lock and dam within eighteen months from the passage of this Act, and the same shall be completed within two years from the date of beginning the construction, the right being reserved to the United States to enter on the construction of said lock and dam, if deemed advisable, at any time before the work is commenced by said contracting party; or if begun and not carried on in strict accordance with the directions of the Secretary of War, then the United States may assume the further construction and completion of said work at its option, the cost of such further construction and completion to be paid by the said contracting individual.

Time of construction.

SEC. 3. That the deed to the United States to the land to be purchased and donated to the same, as mentioned in the first section of this Act, shall be executed and delivered within twelve months after the passage of this Act; and, further, that the Secretary of War shall determine from time to time whether the work is being properly done, and may require an increase in force to be employed by the contractor, so as to force the work to completion within the limit mentioned in the Act.

Deed.

Character of work.

SEC. 4. That in consideration of the construction of said lock and dam, free of cost to the United States except as provided in section one of this Act, the United States hereby grants to the person constructing said lock and dam under the provisions of this Act such rights as it possesses to use the water power produced by said dam and to convert the same into electric power or otherwise utilize it for a period of ninety-nine years: *Provided*, That he shall furnish the necessary electric current while his power plant is in operation to move the gates and operate the locks and to light the United States buildings and grounds free of cost to the United States: *Provided further*, That the said person shall operate and maintain the said locks, affording passage to all boats and craft desiring to use the same, but the Secretary of War, in the interest of navigation, may relieve him of this obligation: *And provided further*, That the plans for the necessary works and structures to utilize said water power shall be approved by the Secretary of War, and that nothing shall be done in the use of the water from said dam or otherwise to interfere with or in any way impede or retard the proper and complete navigation of the river at all times, nor in any way to interfere with the use and control of the same by the United States for the purposes of navigation: *And provided further*, That the Secretary of War is hereby authorized to prescribe regulations to govern the use of the said water power and the operations of the plant and force employed in connection therewith; and no claim shall be made against the United States for any failure of water power resulting from any cause whatever.

Grant of water-power privileges.

Proviso.

Electric current.

Operating locks.

Secretary of War to approve plans, etc.

Regulations.

SEC. 5. That in case of failure on the part of said J. A. Ohlberg, junior, his heirs and assigns, for a period of twelve months to formally notify the Secretary of War of his intention to proceed with the construction of the lock and dam as herein provided, then it shall be lawful for the Secretary of War to contract with any private corporation, company, firm, or persons for the construction of said lock and dam on the terms and in the manner herein provided: *Provided*, That the Secretary of War may require the contracting party to execute a bond, with proper sureties, before the commencement of the work, in such amount as he may consider necessary, not exceeding one hundred thousand dollars, to insure the commencement, prosecution, and completion of the work herein authorized and compliance with the terms, conditions, and requirements of this Act; and in case of failure to comply with the requirements of said bond the said contracting party shall forfeit to the United States the full amount thereof.

Failure to notify.

New contract.

Proviso.

Bond.

Forfeiture.

SEC. 6. That the right is expressly reserved in the United States to revoke by Act of Congress the rights, privileges, and benefits conferred by this Act; but in the event of such revocation the United States shall pay to the corporation, company, firm, or persons who may erect said lock and dam under the provisions of this Act

Revocation.

Compensation for improvements.

as full compensation the reasonable value, exclusive of the franchise hereby conferred, of all properties erected and lands purchased by them necessary for the enjoyment of the benefits conferred upon them by the provisions of this Act, such value to be determined by mutual agreement between the Secretary of War and the owners of said properties; and in case they can not agree, then by proceedings instituted in the United States circuit court for the condemnation of said property, such proceedings to conform as nearly as may be to the laws of the State of Arkansas in respect of condemning land for the right of way for railroad purposes: *Provided*, That to insure compliance with the terms of the contract or of this Act, or to protect the interests of navigation, the Secretary of War shall have power at any time, before or after the completion of the work, to order a suspension of all privileges granted by this Act: *And provided further*, That compliance with such order of suspension may be enforced by the injunction of the circuit court of the United States exercising jurisdiction in the district in which the work is situated, and proper proceedings to this end shall be instituted by the Attorney-General upon request of the Secretary of War.

Determining value of.

Provisos. Suspension of privileges.

Enforcement by injunction.

Jurisdiction and existing law not affected.

SEC. 7. That nothing in this Act shall be construed as in any way interfering with the exclusive jurisdiction over and control by the United States of the White River and the lock and dam therein to be erected for the purpose of navigation, nor as repealing or modifying any of the provisions of law now existing in reference to the protection of navigation.

Approved, June 29, 1906.

ADDITIONAL LEGISLATION

Muskingum, Green, and Barren rivers.—In addition to the water-power privileges granted by the aforementioned acts, Congress, in the river and harbor acts of 1888 and 1890, authorizes and empowers the Secretary of War to grant leases or licenses for the use of the water power on the Muskingum, Green, and Barren rivers, as shown by the following extracts from those laws, to wit:

[Extract from river and harbor act of August 11, 1888: Muskingum River]

Muskingum River Ohio.

Improving Muskingum River, Ohio: For the construction of a lock at Taylorsville and the reconstruction of the lock at Zanesville, pursuant to the report of the engineers, one hundred and two thousand dollars; and the Secretary of War is hereby authorized and empowered to grant leases or licenses for the use of the water powers on the Muskingum River at such rate and on such conditions and for such periods of time as may seem to him just, equitable, and expedient: *Provided*, That the leases or licenses shall be limited to the use of the surplus water

Proviso. Water-power rights.

not required for navigation. And he is also empowered to grant leases or licenses for the occupation of such lands belonging to the United States on said Muskingum River as may be required for mill-sites or for other purposes not inconsistent with the requirements of navigation; and all moneys received under such leases or licenses shall be turned into the Treasury of the United States, and the itemized statement thereof shall accompany the annual report of the Chief of Engineers.

But nothing in this act shall be construed to affect any vested right, if such there be, of any lessee of water power on said river. Vested rights.

[Extract from river and harbor act of September 19, 1890: Green and Barren rivers]

The Secretary of War is hereby authorized and empowered to grant leases or licenses for the use of the water-powers on the Green and Barren Rivers at such a rate and on such conditions and for such periods of time as may seem to him just, equitable, and expedient; said leases not to exceed the period of twenty years: *Provided*, That the leases or licenses shall be limited to the use of the surplus water not required for navigation. And he is also empowered to grant leases or licenses for the occupation of such lands belonging to the United States on said Green and Barren Rivers as may be required for mill-sites or for other purposes not inconsistent with the requirements of navigation; said leases or licenses not to extend beyond the period of twenty years; and all moneys received under such leases or licenses shall be turned into the Treasury of the United States, and the itemized statement thereof shall accompany the annual report of the Chief of Engineers. But nothing in this act shall be construed to affect any vested right, if such there be, of any lessee of water-power on said river.

Green and Barren rivers. Water-power leases. Proviso. Limited to surplus water. Mill-site leases. Moneys covered in. Report, etc. Vested rights.

Following is an extract from the river and harbor act of March 2, 1907, which relates, in part, to the subject of the utilization of water power, to wit:

[Waterway from Chicago to the Gulf]

The Secretary of War may appoint a board of five members, to be composed of three members of the Mississippi River Commission, one of whom shall be the president of such commission, and two engineer officers of the United States Army, to examine the Mississippi River below Saint Louis and report to Congress, at the earliest date by which a thorough examination can be made, upon the practicability and desirability of constructing and maintaining a navigable channel fourteen feet deep and of suitable width from Saint Louis to the mouth of the river, either by the improvement of said river or by a canal or canals for part of said route. In its report the board shall cover the probable cost of such improvement, the probable cost of maintenance, and the present and prospective commerce of said waterway, both local

Board to examine and report on 14-foot channel, St. Louis to mouth of river. Scope.

and general, upstream as well as downstream, and the said board may consider in connection with the examination herein provided for, the survey of a proposed waterway from Chicago to Saint Louis, heretofore reported; it shall also report whether other plans of improvement can be devised by which the probable demands of traffic, present and prospective, can be adequately met, and the sum of one hundred and ninety thousand dollars, or so much thereof as may be necessary, is hereby appropriated for the making of such survey, of which amount only one hundred thousand dollars shall be available, unless in presenting a plan for such waterway it shall be necessary, in the judgment of said board, to make a survey for a lateral canal or canals; and the force, plant, and records of the Mississippi River Commission shall be available for the use of said board in making said examination; and said board shall also at the earliest date practicable report upon the following:

Subjects of report.

First. What depth of channel is it practicable to produce between Saint Louis and Cairo at low water by means of regulation works.

Second. What depth will obtain in such regulated channel at the average stage of water for the year.

Third. For what average number of days annually will fourteen feet of water obtain in such regulated channel.

Fourth. What increase of depth will be obtained over the natural flow of water in such regulated channel by an added volume of ten thousand cubic feet per second; also fourteen thousand cubic feet per second.

Fifth. And the board shall consider further the practicability of producing at all seasons of the year a depth of fourteen feet in such regulated channel by the aid of locks and dams similar to those projected and in use on the Ohio River improvement.

Sixth. And the said Board shall also report upon any water power which may be created in the portion herein directed to be surveyed, as well as in the proposed waterway from Saint Louis to Chicago heretofore surveyed, and the value thereof, and what means should be taken in order that the Government of the United States may conserve the same or receive adequate compensation therefor, and upon any lands which may be drained by the construction of either of said proposed waterways, and shall also report what steps, if any, shall be taken to cause the cost of the improvement to be defrayed, in whole or part, by means of such water power or lands.

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O

Errata on map B (in pocket).

For "Rechelieu" *read* Richelieu River in Canada.

For "Esterville-Minim" *read* Estherville-Minim (S. C.).

For "Guinguard" *read* Guignard Landing in S. C.

For "Fort Bassenger" *read* Fort Bassinger (Fla.).

For "Andalusia" *read* Andalusia, and place near the head of navigation on Conecuh River.

For "Choctawhatchie" *read* Choctawhatchee (River in Fla.).

For "Lesuer" *read* LeSueur (Minn.).

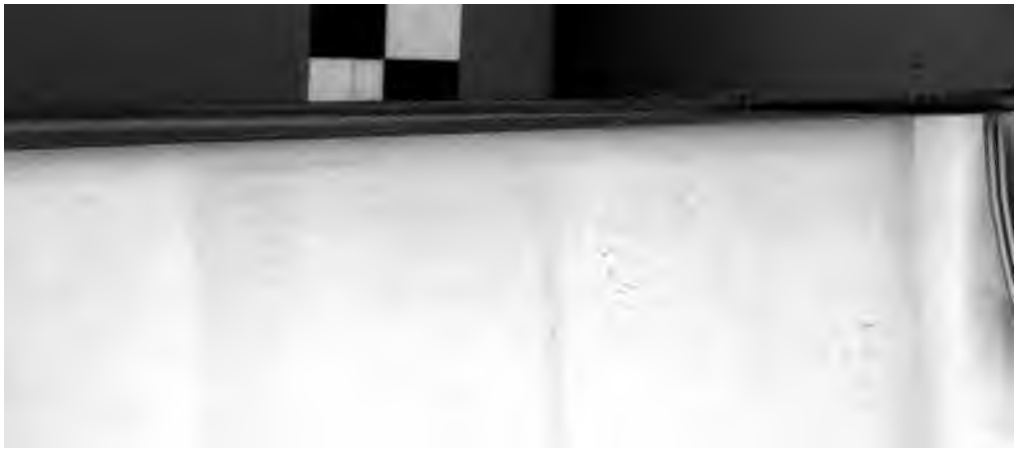
For "Stocton" *read* Stockton (Cal.).

Chowan, Blackwater, Meherrin, and Nottoway Rivers in North Carolina and Virginia, listed among the Navigable Streams (page [illegible]), do not appear on map.

Coosa River, Alabama, is *not* navigable between Wetumpka and Lock 4 (117 miles).

A break in navigability of the Mississippi should be shown at Minneapolis.

"Cascades Canal" (Ore.) should appear below The Dalles (Columbia River).

A break in navigability should be shown above The Dalles.

The upper Columbia (in Washington), is navigable between Bridgeport and Wenatchie.